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Communities NSW (Sport and Recreation)

Southern Highlands Regional Shooting Complex

Ecological Management Plan

September 2010

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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Definitions and Abbreviations

CEMP	Construction Environmental Management Plan
Contractor	Persons undertaking the construction works
Contractor's Site Manager	Manager of the construction site during pre-construction and construction phase of the development appointed by the contractor.
DECC	The NSW Department of Environment and Climate Change (now DECCW)
DECCW	The NSW Department of Environment and Climate Change (formerly DECC)
DEH	The Commonwealth Department of Environment and Heritage (now DEWHA)
DEWHA	The Commonwealth Department of the Environment, Water, Heritage and the Arts (formerly DEH)
DoP	The NSW Department of Planning
EMP	Ecological Management Plan
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GHD	GHD Pty Ltd
Land Manager	Department of Communities NSW (Sport and Recreation)
LGA	Local Government Area
MNES	Matters of National Environmental Significance (under the EPBC Act)
NPWS	NSW National Parks and Wildlife Service
NW Act	NSW *Noxious Weeds Act 1993*
OEMP	Operational Environmental Management Plan
Communities NSW Ecologist	Suitably qualified and experienced professional ecologist(s) required to undertake pre-construction spring surveys and to provide advice and ecological services to Communities NSW with respect to the Plan area
Contractor's Ecologist(s)	Suitably qualified and experienced professional ecologist(s) engaged by the contractor to undertake site-based ecology requirements and provide Project specific ecological advice during the pre-construction and construction phases of the development

CEMP	Construction Environmental Management Plan
Site Manager	Appointed manager of construction site.
SHRSC	Southern Highlands Regional Shooting Complex
TSC Act	*NSW Threatened Species Conservation Act 1995*
Wildlife Specialist(s)	Suitably qualified and experienced environmental professional(s) in possession of relevant licences to handle native, threatened, sick and injured fauna during the pre-construction and construction phases of the development to be engaged by the contractor

1. Foreword

This Ecological Management Plan (EMP) has been prepared arising from the vesting of Lot 100 DP 1088254 to the 'Minister Administering the Sporting Venues Authorities Act' for the development of the Southern Highlands Regional Shooting Complex (SHRSC) at Hill Top.

The EMP meets the requirements of Major Project 06_0232 Determination of the Minister for Planning dated 1st March 2010 in respect to Development Condition B2 (Ecological Management Plan) related to the establishment of the SHRSC (see Appendix A).

Lot 100 (the 'plan area') comprises 136 hectares zoned SP1 (Special Activities) and 900 hectares zoned E2 (Environmental Conservation). SP1 is licensed to the Southern Highlands Regional Shooting Complex Inc (SHRSC Inc) to operate as a shooting complex and Communities NSW (Sport and Recreation) will administer the site through fee and licence arrangements with this body. The SHRSC Inc occupy the licensed area and manage the day-to-day activities of the ranges in accordance with licence conditions, an Operational Environment Management Plan (OEMP) an approved Constitution and development Conditions approved by the Minister for Planning on 1st March, 2010.

This EMP contains management procedures to minimise the potential for adverse impacts on biodiversity values on the site as a result of the proposed Shooting Complex development within the SP1 zone and to guide the ongoing management of the natural areas outside of the developed range precincts, the latter comprising 25 hectares when fully operational. The Plan reflects the commitment of Communities NSW (Sport and Recreation) to manage the natural areas of the Lot for environmental conservation consistent with government and community standards of conservation management.

The EMP supports an environmental and conservation management scheme incorporated in a Conservation Agreement under provisions of the *National Parks and Wildlife Act 1974* (see Appendix B) to be signed between the Minister administering the NSW *National Parks and Wildlife Act* and the Minister administering the *Sporting Venues Authorities Act 2008* (owner) for Lot 1, DP 1088254 on (date to be inserted). This statutory Agreement details the conservation values of the site and incorporates the owner's commitment to those values. It became effective on (date to be inserted).

2. Introduction

Lot 100 DP 1088254 is located on Wattle Ridge Road approximately 5.5 km northwest of the Hill Top village centre in the Wingecarribee Local Government Area (Figure 1).

A total of 136 hectares of the site is zoned SP1 (Special Activities), and 900 hectares zoned E2 (Environmental Conservation) under the Wingecarribee Local Environmental Plan. A map of the Plan area and envelope of the shooting ranges is provided in Figure 2.

When fully operational, the site will incorporate within the approved SP1 Zone approved by the Minister for Planning, six discrete shooting ranges, including an indoor air range. The initial development will provide two additional ranges (500 metre rifle range and 50 metre pistol range) to the 800 metre rifle range which has operated at the site since 1986. It is acknowledged that the proposed development activities within the SP1 zone and potential off-range impacts on the natural conservation values of the site need to be identified, monitored and managed. The purpose of this EMP is to provide a framework for these impacts to be managed.

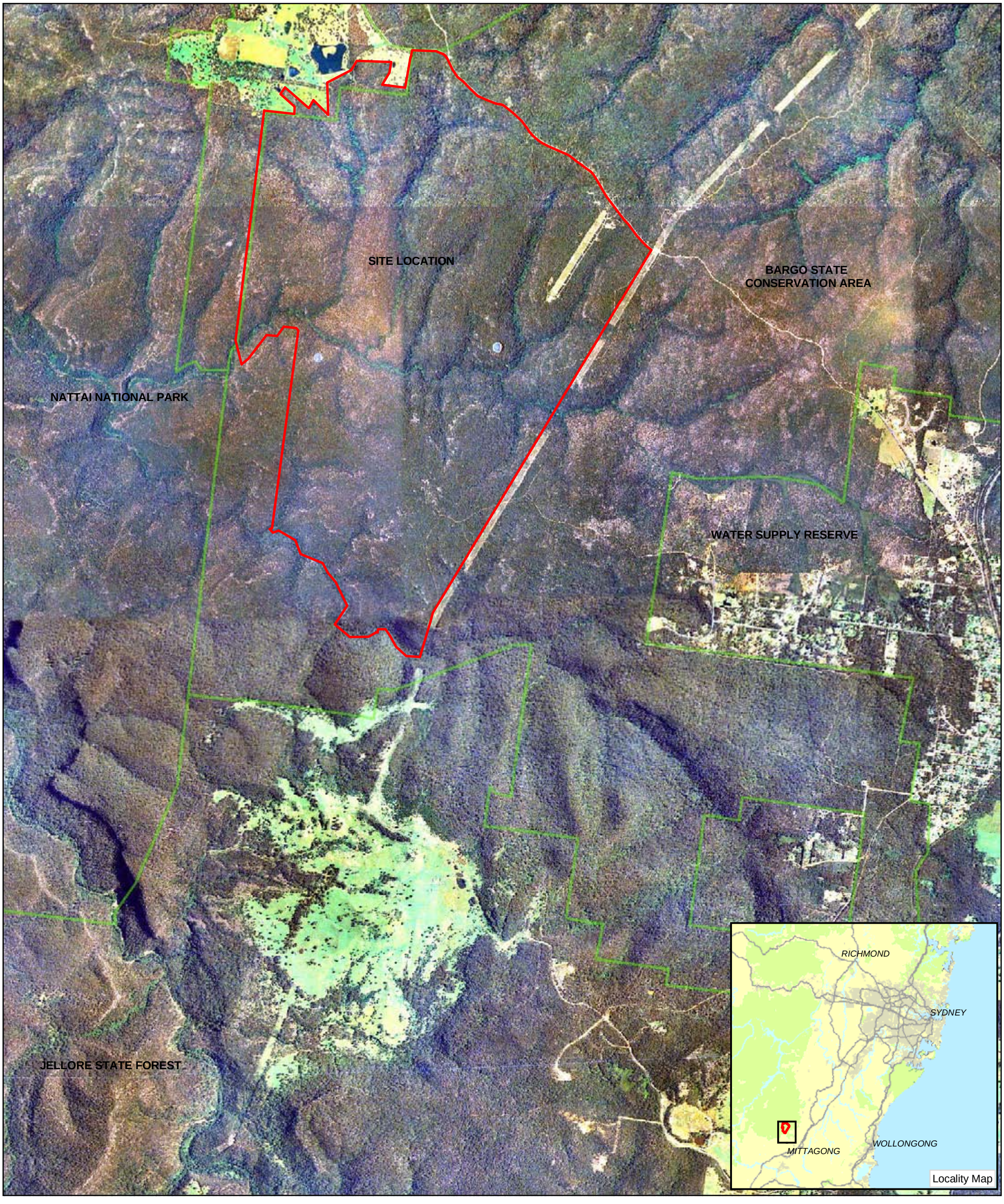
A Construction Environmental Management Plan (CEMP) has been prepared on behalf of Communities NSW (Sport and Recreation) for implementation during construction of the SHRSC (GHD 2010a). The CEMP provides a system and procedures to address and mitigate potential impacts to the environment and contains mitigation measures detailed in this EMP, the Soil and Water Management Plan (GHD 2010b) and Bushfire Management Plan (GHD 2010e) as appropriate. The CEMP is designed to provide environmental guidance to personnel involved in the construction of the SHRSC.

Communities NSW (Sport and Recreation) will administer overall functioning and operational management of the Plan area. This will be achieved primarily through licensing and fee arrangements with the Southern Highlands Regional Shooting Complex Inc in respect to the shooting range areas, detailing, amongst other matters, the obligations of that group consistent with this EMP. An Operational Environmental Management Plan (OEMP), including mitigation measures from the EMP has been prepared to minimise the potential for adverse impacts on flora and fauna as a result of the day-to-day operational activities of the SHRSC (GHD 2010d).

Agreement in principle has been reached between Communities NSW (Sport and Recreation) and the Parks and Wildlife Group (PWG) (an agency of the Department of Environment, Climate Change and Water- DECCW) for a Memorandum of Understanding between the two agencies. The MOU provides that the PWG (Nattai area) will provide professional and technical fauna and flora and land management advice for the Plan area, excluding the cleared areas that constitute the approved shooting ranges. The land management advice will be directed to ensuring that Communities NSW and the licence holder act to uphold the environmental and conservation values of the site consistent with the Nattai Reserves Plan of Management and the Southern Highlands Regional Shooting Complex Conservation Agreement (see Appendix B).

The PWG (Nattai area) will provide an annual works program for the site for approval by Communities NSW that outlines ecological management initiatives consistent with programs to be applied to the surrounding national park areas managed by that agency. A copy of this EMP will be provided to the Area Manager, Nattai Area, PWG, DECCW to assist in Plan management and implementation.

Regulations pursuant to Section 40 (1) and (2) of the Sporting Venues Authorities Act will apply to the site. Rangers appointed pursuant to Section 37 of the Act will be empowered to enforce Regulations relating to the care, control and management of the Plan area.



LEGEND

Site Boundary

Nature Conservation Reserve

1:30,000 (at A3)

0 150 300 600 900 1,200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

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NSW Shooting & Recreation
Southern Highlands Regional Shooting Complex

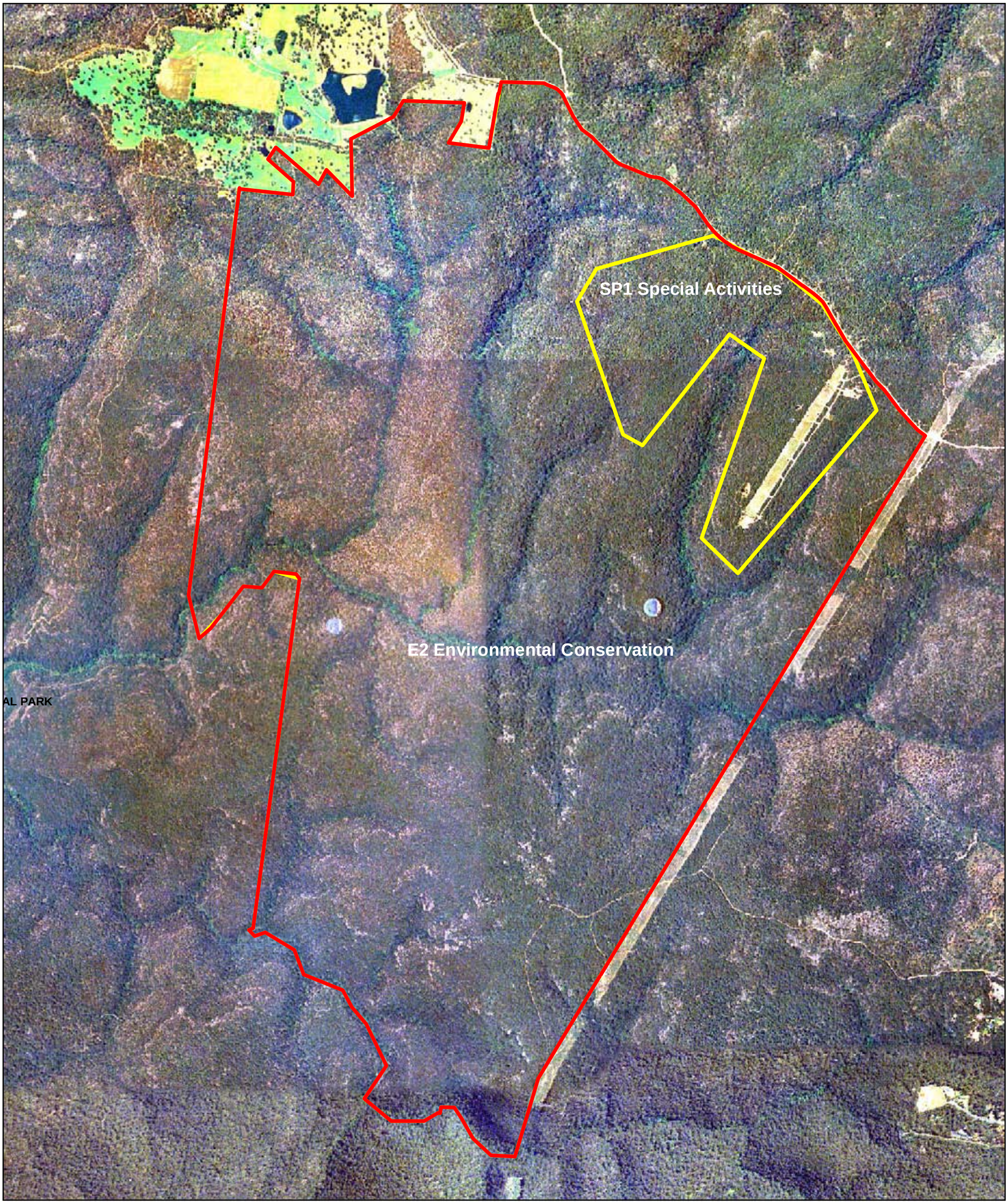
Job Number 21-15073
Revision A
Date 06 MAY 2010

Site Location

Figure 1

C:\Documents and Settings\qjchung\My Documents\Work\2115073_01_SiteLocation.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au



LEGEND

Site Boundary

Zone SP1

1:17,000 (at A3)

0 87.5 175 350 525 700

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

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GHD

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NSW Communities
Southern Highlands Regional Shooting Complex

Job Number 21-17850
Revision A
Date 26 AUG 2010

Management Zones within Plan Area

Figure 2

G:\21\17850\GIS\Map_Documents\2115073_Z004_Management Zones.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Data Custodian: Data Set Name/Title - Version/Date. Created by: qjchung, RPHamer

2.1 General Purpose and Objectives

The EMP aims to protect the high biodiversity values within the Plan area and reduce the potential for the proposed development to impact on the broader E2 environmental conservation area. This EMP provides environmental management approaches and measures to minimise potential adverse impacts on the natural environment during the three phases of the project (pre-construction; construction; operational).

The following objectives apply:

- Protect and monitor the biodiversity values of the area as detailed in Section 3;
- Maintenance of natural processes as far as possible;
- Ensure that the activities of the Southern Highlands Regional Shooting Complex do not impact on the natural conservation and environmental values of the site;
- Ensure that there is no increase in the populations of introduced species;
- Manage the area co-operatively with land management agencies, regulatory authorities and the Southern Highlands Regional Shooting Complex Inc; and
- Manage the area consistent with the following:
  - NSW *Environmental Planning and Assessment Act 1979* Determination of Major Project No. 06_0232: Schedule 2 Conditions of Approval (Department of Planning, 2010) – see Appendix A;
  - Items 1 and 2 of Annexure 'C' of the Conservation Agreement (relating to Lot 100, Deposited Plan 1088254) between the Minister Administering the New South Wales *National Parks and Wildlife Act* (1974) and The Minister administering the *Sporting Venues Authorities Act* (2008) – see Appendix B;
  - National Parks and Wildlife Nattai Reserves Plan of Management and any subsequent amendments; and
  - Memorandum of Understanding between Communities NSW and Parks and Wildlife Group (an Agency of DECCW) to protect and manage the flora and fauna and environmental values of the Plan area – see Appendix C.

2.2 Relationship to Other Documents

This Ecological Management Plan has been prepared with reference to the following:

- Southern Highlands Regional Shooting Complex Supplementary Ecological Assessment: Section 7-Mitigation Measures (GHD, 2008);
- Southern Highlands Regional Shooting Complex Determination of Major Project No. 06_0232: Schedule 2 (Department of Planning, 2010) – see Appendix A;
- Southern Highlands Regional Shooting Complex Draft Conservation and Environmental Management Plan (NSW Sport and Recreation, 2009);
- Southern Highlands Regional Shooting Complex Conservation Agreement [to be enacted between the Minister Administering the New South Wales National Parks and Wildlife Act (1974) and The Minister administering the Sporting Venues Authorities Act (2008)] – see Appendix B;

- Memorandum of Understanding between Communities NSW and Parks and Wildlife Group (an Agency of DECCW) to protect and manage the flora and fauna and environmental values of the Plan area – Appendix C;
- Southern Highlands Regional Shooting Complex Construction Environmental Management Plan (GHD 2010a);
- Southern Highlands Regional Shooting Complex Soil and Water Management Plan (GHD 2010b);
- Southern Highlands Regional Shooting Complex Water Cycle Management Plan (GHD 2010c);
- Southern Highlands Regional Shooting Complex Operational Environmental Management Plan (GHD 2010d); and
- Southern Highlands Regional Shooting Bushfire Management Plan (GHD 2010e).

This EMP forms a sub-plan to the CEMP (GHD 2010a) and the OEMP (GHD 2010d) for the SHRSC. It should be read in conjunction with the CEMP and OEMP as well as the Bushfire Management Plan (BMP) and the Soil and Water and Water Cycle Management Plans.

2.3 Detailed Management Procedures

Specific flora and fauna management procedures have been developed for implementation during the three stages of the proposed development (i.e. pre-construction, construction and operational phases) to minimise the potential for adverse impacts on native flora and fauna, including threatened species, and their habitats. Management procedures are presented in Appendix E. Appropriate development phases for implementation of the management procedures are summarised in Table 1 and discussed further in Section 5.

Table 1 Development phases and management procedures for implementation

Management Procedure	Pre-construction Phase	Construction Phase	Operational Phase
Habitat Feature Identification Procedure	X		
Threatened Flora Management Procedure		X	X
Habitat Clearing and Hollow Tree Removal Procedure		X	
Fauna Management Procedure		X	X
Handling and Management of Fauna Procedure		X	X
Reinstatement of Fauna Habitat Features Procedure		X	
Biosecurity Procedures		X	X
Weed Management Strategy	X	X	X
Rehabilitation Procedure		X	X

2.4 Supplementary Spring Surveys

Targeted spring flora and fauna surveys have been undertaken prior to the commencement of vegetation clearing and construction activities for the proposed development in accordance with Part B *B2* (a) of the Conditions of Approval for the project (Appendix A). The surveys build on the existing survey effort undertaken on the site during the ecological assessments for the Part 3A Environmental Assessment (GHD 2007, 2008). The primary objectives of the surveys have been to provide additional information on the presence of threatened flora and fauna species and ensure appropriate impact mitigation and management measures are in place (detailed within this EMP) to minimise the potential for adverse impacts in particular during the construction of the SHRSC.

Details of the Spring surveys, including methods, survey effort and results are appended to this EMP (see Appendix F).

2.5 Timeframes

This EMP will be reviewed every 5 years in collaboration with stakeholders.

3. Existing Environment

3.1 Site Location and Description

The Plan area is located in the Wingecarribee LGA near the village of Hill Top in the southern highlands of New South Wales, approximately 11 km north of Mittagong. Mittagong is located at the south-western end of the Sydney Basin between the upper reaches of the Nepean River and other rivers such as the Wollondilly, Nattai, Bargo and Wingecarribee. These rivers flow into the Nepean River further to the north.

The SP1 zone of the Plan area is currently the location of the Hill Top Rifle Range. The Southern Highlands Rifle Club licensed land on which the range is located, from the National Parks and Wildlife Service, on 3 June 1993. The existing Hilltop Rifle Range consists of a seven-target rifle range 800 m long, with firing mounds at 100 m intervals. A small clubhouse, toilet facilities and informal car parking are also located on site.

1,036 hectares (ha) of land has been excised from the Bargo State Conservation Area by means of the *National Parks and Wildlife* (*Adjustment of Areas*) *Act 2006*. The proposed SHRSC development would occupy an area of approximately 16 ha within this land (the existing range occupies approximately 9 ha). The area occupied by the range and associated facilities would be cleared as part of the proposal. The remainder of the land on the site (1011 ha) would be retained in its existing condition as a vegetation buffer zone. This area would act as a safety zone for the proposal.

The Plan area is located within the Southern Highlands region. The area is surrounded by the Bargo State Conservation area which adjoins Nattai National Park. This region has extensive and significant natural areas which are part of the Sydney Basin Landscape. This landscape provides outstanding scenic and natural values. Many of the natural areas are protected by classification as Nature Reserves, National Parks, or within the Greater Blue Mountains World Heritage Area. The Nattai National Park is an integral component of the Greater Blue Mountains World Heritage Area. The park is managed to protect, conserve and present the World Heritage values of the area. The natural areas of the region also fulfil an important function in the protection of catchment values for Sydney's water supply.

3.2 Surrounding Land Uses

The site is bound by:

- Wattle Ridge – a grazing property/residence which adjoins the site to the northwest (located approximately 2.5 km north of the existing range);
- Bargo State Conservation Area to the southwest;
- A 330 kV cleared electricity easement (Transgrid) to the southeast; and
- Wattle Ridge Road to the northeast.

Bargo State Conservation Area is located further southwest, southeast and northeast. Nattai National Park is located further to the northwest, on the opposite site of the Wattle Ridge property. Nattai National Park is accessible from the end of Wattle Ridge Road approximately 3 km away.

3.3 Climate

The average annual rainfall in the area is 911.0 mm. During Summer the temperatures range from between an average maximum of 23 - 26^{o}C and an average minimum of 12 - 15^{o}C. In Winter the average maximum drops to 11 - 14^{o}C and the average minimum to 2 - 5^{o}C (Bowral Weather Centre (Parry Dr, Latitude: -34.49; Longitude: 150.40 - Bureau of Meteorology 2008).

3.4 Geology, Soils and Topography

Topographically and geologically the area is transitional between the Cumberland Plain of the Sydney Basin and the southern uplands.

The underlying geology of the site comprises the Hawkesbury Sandstone of the Mittagong Formation (Herbert and Helby, 1980). The site lies within an outcrop of the Narrabeen group, which comprises sandstone, claystone and siltstone. The Hawkesbury sandstone overlies a Triassic shale unit, the Wianamatta Group.

The site is characterised by relatively flat topography, being situated on a spurline that trends to the north from the Wattle Ridge Range. This spurline occupies a position between two tributaries of Rocky Waterholes Creek. All watercourses are upper tributaries of the Nattai River.

The three main groups of soils that occur within the region are (NPWS, 2001):

- Sandstone tableland soils;
- Valley soils (sandstone derived); and
- Soils associated with nutrient rich shales and igneous rocks.

Land surfaces in the site do not appear to have been significantly transformed. These soil landscape types are unstable when disturbed. They are highly susceptible to mass movement, such as slides and rock falls, as well as wind and water erosion (Hazelton and Tille, 1990). A major cause of erosion in an area of this type is fire. After a fire in which the crowns are consumed, the loose sandy soils remain bare for a long period. If rain then shortly follows a fire, there is a resulting increase in surface run-off, causing increased erosion, and a reduction in plant propagation and animal habitats.

3.5 Waterways

Rocky Waterholes Creek, located approximately 1.5 km south of the site drains directly to the Nattai River approximately 6 km to the west of the existing Hilltop Rifle Range. The Nattai River drains north to Lake Burragorang. The catchment of Rocky Waterholes Creek is approximately 23.5 square kilometres, while the catchment of the Nattai River upstream of the junction with Rocky Waterholes Creek is some 240 square kilometres.

3.6 Flora

3.6.1 Floristic diversity

The SP1 zone and surrounding E2 lands (Figure 2) contain a high level of floristic diversity (GHD 2008). Species recorded in the SP1 area during vegetation quadrat surveys for the SHRSC Ecological Impact Assessment (GHD 2008) are presented in Appendix H. A large number of additional flora species are anticipated to be present throughout the Plan area.

No threatened flora species listed under the NSW TSC Act or the Commonwealth EPBC Act have been recorded within the SP1 zone during surveys undertaken for the Project Ecological Impact Assessment Reports (GHD 2007, 2008), supplementary vegetation quadrats sampled by Clements & Associates (2008) or during the supplementary spring surveys undertaking in October 2009, November 2009 and September 2010 (see Appendix F). The Plan area, however, contains potential habitat for seven plant species listed as threatened under the TSC Act and the EPBC Act. These are listed in Table 2. The Plan area also has the potential to contain regionally significant plant species, such as *Eucalyptus apiculata* (Conservation Agreement, 2010), although this or other regionally significant species have not been recorded during surveys in the SP1 zone.

Table 2 Threatened flora species that have the potential to occur

Species	TSC Act	EPBC Act	Recorded On Site
Bynoe's Wattle (*Acacia bynoeana*)	E	V	No
Needle Geebung (*Persoonia acerosa*)	V	V	No
Bargo Geebung (*Persoonia bargoensis*)	E	V	No
Hairy Geebung (*Persoonia hirsuta*)	E	E	No
Mittagong Geebung (*Persoonia glaucescens)*	E	V	No
Grevillea parviflora subsp. *parviflora*	V	V	No
Leafless Tongue Orchid (*Cryptostylis hunteriana)*	V	V	No

TSC Act = *Threatened Species Conservation Act 1995*; EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*; V = vulnerable species E= endangered species

These threatened species (with the exception of *C. hunteriana*) are disturbance colonising species. This means there is the possibility such species if present could potentially occur along access track shoulders, where vegetation has been cleared and soils disturbed. Specific mitigation procedures to ameliorate potential threats associated with access track grading and maintenance in the Plan area for such species should they occur are further discussed in Section 5.2.

3.6.2 Vegetation communities

The vegetation of the surrounding Bargo SCA and other reserves is undisturbed and is similar to its pre-1750 condition (DEC 2004). The vegetation is diverse given the varied topography of the plan area with its numerous aspects, ridge-tops, incised gullies and creek lines.

A number of vegetation surveys and mapping have been undertaken within the locality (Eco Logical 2003; DECC 2004; Clements 2008; GHD 2007, 2008) and have identified two vegetation community classes occurring in the Plan area:

- Sandstone Shrub Woodlands for the majority of the area; and
- Sheltered Sandstone Forests in gully areas.

The vegetation within the S1 zone is relatively uniform Eucalyptus woodland in good condition, with no weed species recorded in surveys (GHD 2008). It is dominated by a mix of Eucalyptus species, including Scribbly Gum (*Eucalyptus sclerophylla*), Grey Gum (*Eucalyptus punctata*), Blue-leaved Stringybark (*Eucalyptus agglomerata*), Sydney Peppermint (*Eucalyptus piperita*), White Stringybark (*Eucalyptus globiodea*), Red Bloodwood (*Corymbia gummifera*) and Mountain Ash (*Eucalyptus sieberi*).

The E2 zone contains largely undisturbed sandstone shrub woodland, heath woodland and mallee vegetation communities with minor variations in canopy and mid-storey dominants as described above. Sheltered sandstone forest occurs on sandstone slopes that descend into steeply dissected gullies and creek lines throughout the E2 zone. Common canopy species comprise Red Bloodwood, Blue-leaved Stringybark, Sydney Peppermint and Grey Gum. The gullies and creek lines have moist forest vegetation communities present.

No Endangered Ecological Communities listed under the TSC or EPBC Acts have been identified in the S1 zone or immediately adjoining lands (DECC 2004; GHD 2008).

3.6.3 Corridor Values

The Plan area is also considered to be of high value given its spatial context within the surrounding landscape. In this regard, the study area is proximate to extensive areas of habitat within Nattai National Park and Bargo State Conservation Area and contributes to a major north-south vegetation/wildlife corridor at this locality which links with east-west regional corridors located to the north and south to the Blue Mountains National Park and Woronora Escarpment and the Coast (GHD, 2008). The subject site also has important catchment and water quality values (Conservation Agreement, 2010).

3.6.4 Weeds

The vegetation within the SP1 zone (outside of existing range facilities) and in the immediate surrounds is currently intact and largely undisturbed, with no weed species recorded within vegetation survey quadrats undertaken for the Ecological Impact Assessment (GHD 2008).

Over 100 weed species have been recorded from survey sites within the surrounding Nattai and Bargo reserves, although most of these occur at low frequency and abundance (DECC, 2004).

Major exotic species that occur in the region include:

- Catsear (*Hypochaeris radicata*);
- Spear Thistle (*Cirsium vulgare*);
- Fireweed (*Senecio madagascariensis*);
- Fleabane (*Conyza* spp.);
- Blackberry (*Rubus* spp.); and
- Nightshades (*Solanum* spp.)

These weed species are currently not abundant within the natural areas of the region, and are generally only present on road edges and upper drainage lines (DECC, 2004).

3.7 Fauna

3.7.1 Fauna habitat

Native vegetation contains a relatively high diversity of habitat resources for native fauna, including a range of food resources (nectar, foliage, seeds, fruits, manna, honeydew, lerps), foraging substrates (foliage, decorticating bark, dead wood, epiphytes, including mistletoe and lichen, woody debris and leaf litter) and potential shelter (tree hollows, dense shrub and groundcover patches, woody debris and rocky outcrops and platforms). The wider E2 zone also contains gully and creek line habitats. Based on these characteristics the Plan area would be expected to support a wide range of birds, reptiles, frogs and mammals (GHD 2008).

Fauna habitats at the site are of particular value, given:

- The presence of relatively large tracts of intact fauna habitat;
- The site contains a large area of forested land which is currently contiguous with extensive tracts of native vegetation within the Bargo State Conservation Area and contributes to a major east-west vegetation/wildlife corridor at this locality;
- The presence of a variety of habitat types with moderate structural and floristic diversity (e.g. forest/woodland communities, rocky outcrops, small dams and ephemeral creek lines) which provide resources for a variety of native flora and fauna, including threatened species;
- The Plan area provides known habitat for at least 5 threatened fauna species and potential habitat for additional threatened species considered likely to occur (Table 3; GHD 2008);
- The presence of hollow-bearing trees. These trees are of importance to hollow dependent fauna species, including threatened species which occur in the study area (e.g. Yellow-bellied Glider, Barking Owl and tree-roosting microbats) and others known from the locality (Table 3); and
- Contains known habitat for the Koala with a variety of preferred Koala food trees (e.g. Grey Gum and Silvertop Ash).

The area is also considered to be of high value for native fauna being linked to extensive areas of habitat within Nattai National Park and Bargo State Conservation Area, and contributes to a major vegetation/wildlife corridor (the Bargo to Morton National Park Regional Biodiversity Corridor) (GHD 2008). The connectivity of these habitat resources is important for the persistence of local fauna populations.

3.7.2 Native fauna

A total of 137 terrestrial vertebrate species have been recorded in the SP1 area during surveys undertaken for the Project Ecological Impact Assessment Reports (GHD 2007, 2008) and during the supplementary spring surveys undertaking in October 2008, November 2009 and September 2010 (see Appendix F). This total comprises eighty-eight birds (88); thirty-one mammals, including a number of tentative microbat identifications (31); nine amphibians (9) and nine reptiles (9). A combined fauna species list for the site is provided in Appendix F. Fauna species diversity is likely to be higher, given the habitat resources contained within the wider E2 zone and in the extensive areas of contiguous vegetation surrounding the Plan area.

Five (5) threatened species listed under the TSC Act have been confidently recorded in the Plan area. These are the Barking Owl (*Ninox connivens*), Gang-gang Cockatoo (*Callocephalon fimbriatum*), Scarlet Robin (*Petroica boodang*), Koala (*Phascolarctos cinereus*) and Yellow-bellied Glider (*Petaurus australis*). Three threatened microchiropteran bats listed as Vulnerable species under the TSC Act were tentatively recorded as 'probable identifications' on the basis of Anabat results for the September 2010 surveys (Appendix F). These are the Little Bent-wing Bat (*Miniopterus australis*), Eastern Falsistrelle (*Falsisterellus tasmaniensis*) and the Greater Broad-nosed Bat (*Scoteanax reuppellii*). Possible calls of the threatened Large-footed Myotis (*Myotis macropus*) and the Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*) were also recorded through anabat call analysis during the supplementary spring surveys. In addition, a Powerful Owl (*Ninox strenua*) was also tentatively recorded from a very distant call during the November 2009 spring surveys.

All of these species as well as other threatened fauna species previously recorded in the locality and identified in Table 3 could potentially forage and/or roost in the Plan area or on adjoining lands based on the habitats that are present (GHD 2008; Appendix F).

Table 3 Threatened fauna species recorded during field surveys or likely to occur in the locality

Species	TSC Act	EPBC Act	Recorded On Site
Giant Burrowing Frog (*Heleioporus australiacus*)	V	V	No
Red-crowned Toadlet (*Pseudophryne australis*)	V	-	No
Broad-headed Snake (*Hoplocephalus bungaroides*)	E	V	No
Rosenberg's Goanna (*Varanus rosenbergi*)	V	-	No
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	V	-	Yes
Glossy Black Cockatoo (*Calyptorhynchus lathami*)	V	-	No
Brown Treecreeper (*Climacteris picumnus victoriae*)	V	-	No
Swift Parrot (*Lathamus discolor*)	E	E	No
Powerful Owl (*Ninox strenua*)	V	-	Possible call
Barking Owl (*Ninox connivens*)	V	-	Yes
Sooty Owl (*Tyto tenebricosa*)	V	-	No
Masked Owl (*Tyto novaehollandiae*)	V	-	No
Scarlet Robin (*Petroica boodang*)	V	-	Yes
Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*)	V	-	No
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	V	No
Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*)	V	-	Possible* (Anabat)
Little Bentwing Bat (*Miniopterus australis*)	V	-	Probable* (Anabat)
Large-footed Myotis (*Myotis macropus*)	V	-	Possible* (Anabat)
Eastern Freetail Bat (*Mormopterus norfolkensis*)	V	-	No
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	V	-	Probable* (Anabat)
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	V	-	Probable* (Anabat)
Grey-headed Flying Fox (*Pteropus poliocephalus*)	V	V	No
Koala (*Phascolarctos cinereus*)	V		Yes
Spotted-tailed Quoll (*Dasyurus maculatus*)	V	E	No
Southern Brown Bandicoot (*Isoodon obesulus*)	E	E	No
Eastern Pygmy Possum (*Cercartetus nanus*)	V	-	No
Yellow-bellied Glider (*Petaurus australis*)	V		Yes

TSC Act = *NSW Threatened Species Conservation Act 1995*; EPBC Act = *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*; V = vulnerable species E= endangered species

* - See Anabat Confidence Ratings Appendix F – Table 1

3.7.3 Feral pests

The density of feral pest species within the Plan area is unknown, but is likely to be low given the relatively undisturbed nature of the majority of the vegetation present. Feral animals recorded in the general Plan area during recent surveys include the European Red Fox (*Vulpes vulpes*), Dog (*Canis lupus familiaris*) and European Rabbit (*Oryctolagus cuniculus*). The following feral species occur in the region (DECC 2004):

- European Red Fox;
- Rabbit;
- Wild dogs;
- Wild pigs;
- Cats;
- Deer;
- Goats;
- Birds; and
- Fish (such as Carp).

3.7.4 Pathogens

There is no evidence of either Phytophthora (*Phytophthora cinnamomi*) or Amphibian Chytrid Fungus within the SP1 area, nor is either pathogen currently known to be present within the Bargo State Conservation Area (NPWS 2001, A. Johnston DECCW *pers. comm*.). However the Hawkesbury Nepean Catchment Management Authority (2008) lists an occurrence of Phytophthora in Thirlmere Lakes National Park, and both pathogens may persist undetected in an area for considerable periods.

4. Management Policies

4.1 Management Arrangements

A Construction Environmental Management Plan (CEMP) has been prepared on behalf of Communities NSW (Sport and Recreation) for implementation during construction of the SHRSC (GHD 2010a). The CEMP provides a system and procedures to address and mitigate potential impacts to the environment. It covers issues with respect to air quality, waste management, ecology, hazards and risks, bushfire, contamination, soil and water, noise and traffic. The CEMP is designed to provide environmental guidance to key personnel involved in the construction of the works. It contains mitigation measures detailed in this EMP, the Soil and Water MP and Bushfire MP as appropriate.

Communities NSW will administer overall functioning and operational management of the Plan area. This will be achieved primarily through licensing and fee arrangements with the Southern Highlands Regional Shooting Complex Inc in respect to the shooting range areas, detailing – amongst other matters – the obligations of that group consistent with this Management Plan. An Operational Environmental Management Plan (OEMP) has been prepared to minimise the potential for adverse impacts on flora and fauna as a result of the day-to-day operational activities of the SHRSC (GHD 2010d).

In addition, an agreement in principle has been reached between Communities NSW (Sport and Recreation) and the PWG (DECCW) for a Memorandum of Understanding between the two agencies. Under the MOU the PWG (Nattai area) will provide professional and technical fauna and flora and land management advice for the Plan area, excluding the cleared areas that constitute the approved shooting ranges. The land management advice will be directed to ensuring that Communities NSW (Sport and Recreation) and the licence holder act to uphold the environmental and conservation values of the Plan area consistent with the Nattai Reserves Plan of Management and the Southern Highlands Regional Shooting Complex Conservation Agreement (see Appendix B). The PWG will provide an annual works program for the site for approval by Communities NSW that outlines ecological management initiatives consistent with programs to be applied to the surrounding national park areas managed by that agency.

The licence holder will be expected to liaise with and involve representatives of the Hill Top community to ensure that any local concerns in respect to environmental and conservation issues are known and acted on in an appropriate manner.

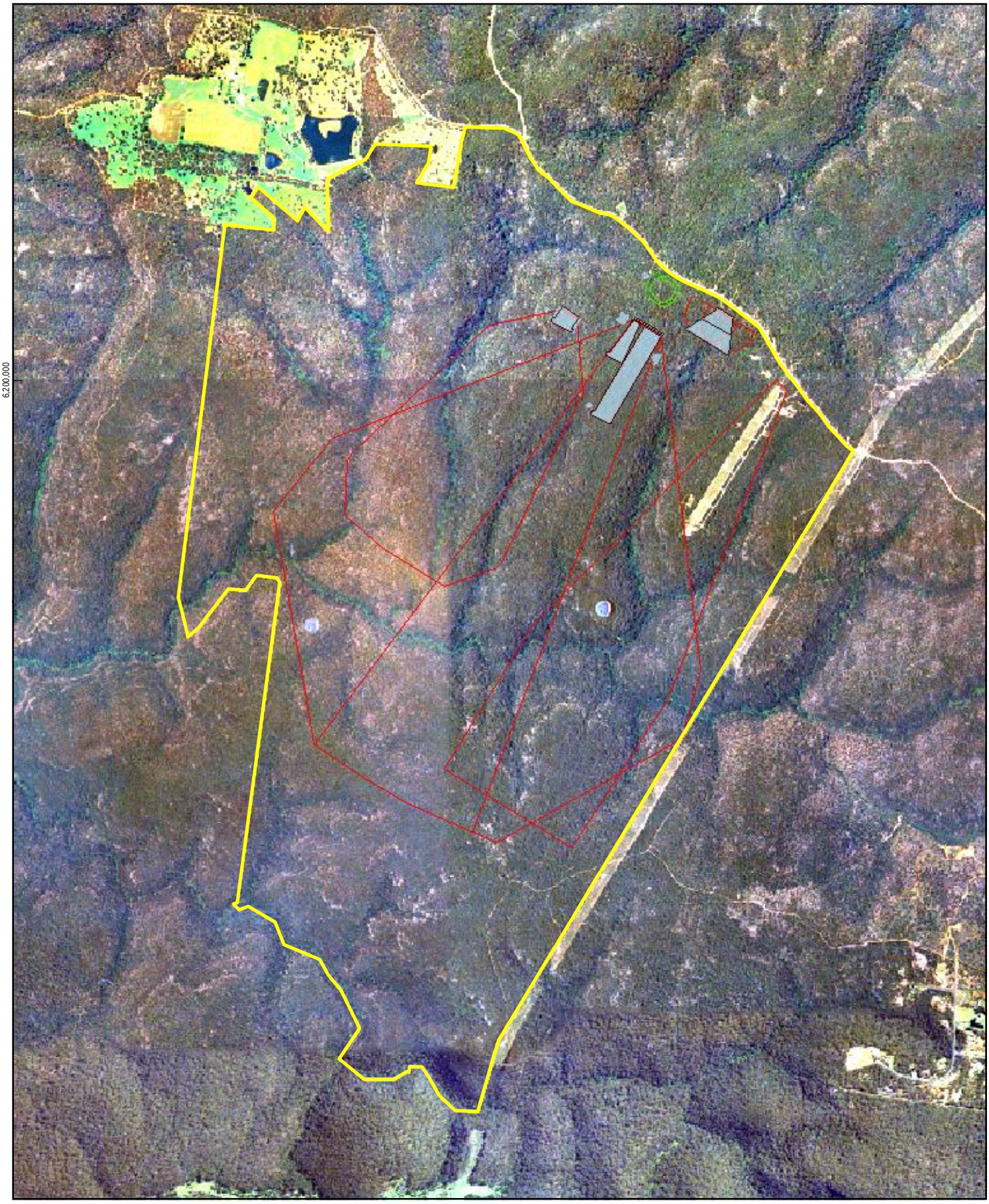
This Management Plan will be reviewed every 5 years in collaboration with stakeholders.

4.2 Permitted Use

The following apply with respect to permitted and non-permitted use of the Plan area:

- Part of the Special Activities SP1 Zone will be progressively developed as rifle, pistol and shot gun ranges and associated facilities as identified in the license agreement between Communities NSW and the Southern Highlands Regional Shooting Complex Inc. and consistent with Development Consent Conditions issued by the Minister for Planning on 1st March 2010;
- There will be no development to the natural areas outside of the shooting range license areas which are caused by the activities of the ranges;
- All areas outside of the shooting range precincts will be managed for environmental conservation;

- Passive recreation activities such as bushwalking are permitted through the area outside of the Range Danger areas Figure 3) consistent with management principles at Section 9 of the *Wilderness Act 1987*;
- No public vehicle access is permitted in the plan area;
- Horse-riding is not permitted in the plan area;
- There will be no development of facilities in the plan area;
- No bee hive sites will be licensed in the plan area; and
- The plan area will be available for conducting scientific research related to cultural or natural values.



Legend

Site Boundary
Range danger area
Full vegetation clearing
Partial vegetation clearing

1:26,000
0 0.125 0.25 0.5
Kilometres
Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

N

Communities NSW

Southern Highlands Regional Shooting Complex

Range Danger Areas

Job Number 21-17850
Revision A
Date 26 August 2010

Figure 3

G:\21\15073\CADD\GIS\MapDocuments\Z038Eco_OffsetPackage.mxd

Data source: GA National 1:250000 Topographic Map Created by: C Wilson

5. Management Issues and Actions

5.1 Management Issues

The following ecological management issues have been identified as of potential relevance to the Plan area:

- Native flora and fauna, including threatened species and their habitats;
- Biosecurity (pathogen and disease control): *Phytophthora cinnamomi* and Amphibian Chytrid Fungus;
- Pest species, including weeds and feral animals;
- Fire Management;
- Off-site impacts, including contamination from runoff and spent lead shot from the operating shooting range; and
- Access.

The above management issues, identified threats and appropriate impact avoidance and mitigation measures are addressed in this Section. Mitigation measures are presented according to when they are to be implemented relative to the three main management phases of the project – pre-construction, construction and operational phases.

The contractor is responsible for engaging appropriately qualified ecologists ('the contractor's ecologist') and wildlife specialists ('the contractor's wildlife specialist') to undertake flora and fauna management tasks during the pre-construction and construction phases of the development as defined below. Tasks to be undertaken by Communities NSW's ecologists are not the responsibility of the contractor.

Pre-construction: The pre-construction phase refers to activities that will be undertaken prior to the commencement of construction activities for the SHRSC development in the SP1 zone i.e. prior to vegetation clearance, soil disturbance and excavation.

Construction: The construction phase commences with the operation of 'clear and grade' machinery in the SP1 zone. This phase of the project involves but is not limited to the establishment of sediment ponds and controls, vegetation clearance, soil removal and stockpiling, and the preparation and construction of built facilities (e.g. access roads, carpark, clubhouse, ranges etc).

Monitoring and incident reporting arising from construction are undertaken during this phase.

Operational: The operational phase refers to the ongoing use of the proposed shooting range and managing and monitoring impacts on surrounding SP1 and E2 zones of the Plan area.

A summary table of flora and fauna impact mitigation actions for the three phases of the development is presented in Appendix D.

5.2 Vegetation Management

The objectives of flora and vegetation management in the Plan area are to protect the diversity, abundance and distribution of flora and vegetation and to mitigate impacts directly related to the construction and operation of the SHRSC development. Mitigation measures aim to comply with relevant

legislation, policy, and Commonwealth and State recovery and action plans relevant to native and threatened fauna species.

The greatest potential for adverse impacts on native vegetation will be in the SP1 zone during the construction phase of the development. Clearing and earthworks in this zone will have an unavoidable direct impact on vegetation within the identified construction footprint and have the potential to result in indirect impacts on surrounding retained vegetation (e.g. through erosion and sedimentation and weed incursion).

There is also the potential for direct and indirect impacts on vegetation in the Plan area during the operational phase of the development (e.g. through off-site contamination) and as a result of routine maintenance and environmental management activities (e.g. access track maintenance).

Potential threats to native vegetation and impact mitigation measures are outlined below for each phase of the development. Specific Management Procedures have been prepared for the management of threatened flora if detected on site and for rehabilitation and landscaping works where required (see Section 5.2.4).

5.2.1 Pre-construction phase

Targeted spring surveys for threatened flora species will be undertaken by Communities NSW's ecologists in the construction area and vicinity and along access tracks to be used during the construction phase of the development prior to the commencement of construction activities, in accordance with the Conditions of Consent for the project (Appendix A). If threatened plants are detected, appropriate management procedures will be developed in consultation with DECCW prior to vegetation clearing or maintenance works.

During the pre-construction phase of the project, an opportunity exists to reduce the total amount of vegetation disturbance. This can be achieved by keeping the proposed construction areas as small as permissible for construction activities and restricting access and activities to dedicated access roads and the construction footprint. In doing so, no excessive vegetation loss will occur and disturbance to surrounding vegetation will be minimised.

Flora and vegetation will be managed during the pre-construction phase by implementing the measures outlined in Table 4.

Table 4 Flora species and vegetation threats and mitigation during pre-construction phase

Threats	Mitigation Procedure
Accidental removal or disturbance of threatened flora species	Targeted spring surveys undertaken by Communities NSW's ecologists to detect species presence and devise appropriate management procedures as relevant (see Appendix F)
Adverse impacts on vegetation due to construction activities	Contractor workforce to be inducted appropriately and educated regarding the management of native flora and fauna. The induction to cover all fauna and flora

Threats	Mitigation Procedure
	management procedures (see Section 6 and Appendix E). Enforcement of Management Procedures and appropriate behaviour by site manager.
Loss of native vegetation through excessive construction footprint	Position infrastructure (e.g. carpark, clubhouse) as far as possible in existing disturbed sites so as to minimise vegetation clearance and encroachment on adjoining retained vegetation. Minimise the construction footprint to an area as small as permissible for construction machinery. Clearly demarcate the construction footprint with high visibility fencing. Erect signs indicating environmental protection 'no go zones' outside the construction footprint.
Impacts on vegetation as a result of bushfire fire	Management of construction activities in hot conditions in accordance with provisions of the CEMP and the requirements of the SHRSC Bushfire Management Plan (GHD 2010e)
Potential for the introduction and spread of weeds during construction phase	Mapping of existing weed occurrence by contractor's ecologists during pre-clearing surveys to establish baseline for determining impacts and informing management actions Closure of unnecessary access tracks

5.2.2 Construction phase

During the construction phase of the project, there will be a degree of unavoidable loss of vegetation associated with building the required facilities. As far as possible, however, this will be kept to the minimum required for construction purposes.

Impacts on vegetation will be confined as far as possible within the construction footprint, but activities may also impact vegetation adjacent to the construction site, along access roads and along main road verges to and from the existing facility. Some threats are addressed and ameliorated in the pre-construction phase, however other mitigation measures pertinent to the negative impacts of day-to-day construction activities are identified in Table 5 below.

Table 5 Vegetation threats and mitigation during construction phase

Threats	Associated mitigation measures
Trampling and accidental clearing of vegetation outside specified construction footprints	Clearing activities confined to construction footprints delineated with temporary high visibility fencing during the pre-construction phase Location of stockpiles, lay down areas, vehicle parking and temporary construction infrastructure within the construction footprint or on already cleared areas and avoiding drip lines of trees.
Damage of vegetation (potentially including disturbance-colonising threatened plant species) along roadsides due to access road upgrades or maintenance	Exercise caution during road grading works to minimise impacts on roadside vegetation. Lopping, felling or removal of trees only permitted where presenting an actual or potential safety menace or obstructing necessary access Implement Threatened Flora Management Procedure (Appendix E)
Damage to vegetation due to dumping of cleared vegetation debris	Stockpile vegetation debris in clearly demarcated areas within the construction footprint and not in vegetated areas. Mulch vegetation debris for use in stabilisation of disturbed soils in accordance with the Soil and Water Management Plan and the Rehabilitation Management Procedure (Appendix E).
Decreased plant health due to dust generation and accumulation	Speed limits enforced to prevent dust generation and damage to vegetation along access roads. Deploy water trucks to spray cleared road surfaces/construction footprint area to help reduce the dust generation (as required).
Reduced natural regeneration of vegetation in rehabilitation areas due to removal of topsoil and associated seedbank	Topsoil removed in the construction phase is to be stockpiled and used in rehabilitation areas if required in accordance with Rehabilitation Management Procedure (see Appendix E).
Introduction of weeds and pathogens	Adhere to Weed Management Strategy and Biosecurity Management Procedures (Appendix E). Ensure personnel and vehicles are free

Threats	Associated mitigation measures
	from weed seeds, by inspecting clothing, boots and vehicles before entry to site. Ensure personnel and vehicles are free from potential pathogens and diseases by using footbaths/vehicle spray down stations. Enforce a 'clean on entry' and 'clean on exit' from site rule for all vehicles.
Weed establishment in cleared areas and on disturbed soils.	Adhere to Weed Management Strategy (Appendix E). Weekly inspection of construction site by Site Manager for new occurrences of weeds and their immediate removal and appropriate disposal.
Sediment runoff from exposed soils.	Installation of sediment detention basins to prevent runoff and sediment from entering adjoining vegetation, gullies, drainage lines and creeks in accordance with Soil and Water Management Plan and Water Cycle Management Plan
Sediment runoff from stockpiled soils.	Stockpile management in accordance with Soil and Water Management Plan and Water Cycle Management Plan
Altered water availability for soil and vegetation due to introduction of hard surfaces.	Location of temporary site buildings away from the drip line of vegetation, so rainwater from canopies can reach the ground surface.
Contamination of soils and groundwater due to the use and storage of chemicals and equipment and accidental spills of pollutants, including fuels.	Management in accordance with Soil and Water Management Plan and Water Cycle Management Plan. Contain all potential contaminants (e.g. bleaches, fuels, oils etc) within bunded areas to avoid environmental contamination.
Loss of flora diversity through invasion of native vegetation by invasive species introduced to site	Adhere to Weed Management Strategy Implement Rehabilitation Management Procedure (see Appendix E). Use of endemic plant species of local provenance in areas requiring revegetation and sterile, non-invasive turf for grassed areas.
Vegetation damage due to vehicle and pedestrian movement across the site, particularly adjacent to built facilities, access roads and car parks.	Installation of signed pathways to restrict access into retained vegetation.

5.2.3 Operational phase

Operation of the SHRSC has the potential to impact vegetation across the Plan area, arising from the use of the rifle range and offsite impacts and maintenance of access roads. Access, including that to undertake ongoing environmental management activities within the wider Plan area, such as weed and pest control and bushfire activities, as well as that for recreational purposes, also has the potential to result in adverse impacts on the vegetation in the wider Plan area.

The Operational Environmental Management Plan (OEMP) for the SHRSC will detail specific mitigation measures incorporated from this EMP and the Soil and Water Management Plan, Water Cycle Management Plan and Bushfire Management Plan to minimise the potential for indirect off-site impacts on native vegetation.

Weed control will also be undertaken in the SP1 zone by professional bush regenerators in accordance with the Weed Management Plan and the Conservation Agreement (2010). It is intended that weed and pest control in the Plan area will be integrated with PWG (Nattai area) weed and pest management within the surrounding DECCW estate under the MOU between the PWG and Communities NSW (Sport and Recreation).

A Bushfire Management Plan has been prepared for the Plan area (GHD 2010e). It addresses the biodiversity conservation goals of bushfire management within the Plan area to and aims to maintain fire regimes that are appropriate and necessary to conserve the environmental values of the area.

The potential threats to vegetation and specific mitigation measures identified for the operational phase are identified in Table 6.

Table 6 Flora and vegetation threats and mitigation during operational phase

Threats	Associated mitigation measures
Damage to surrounding vegetation due to increased visitation or illegal access	Access to surrounding bushland restricted to existing bushwalking tracks. Block off/ restrict access to tracks through surrounding bushland by installing bollards/ large rocks and boulders (obstacles). Rehabilitate unused/ unwanted tracks via natural regeneration method, supplement with plantings if required. Installation of signs at access points restricting off-road access and clearly demarcating walking trails, signage stating ‘stay on marked trails’ (or similar). No new access tracks will be created except for emergency fire management. Internal roads will be maintained to ensure all-weather access for 4WD vehicles. Management of illegal vehicle access considerations will be undertaken jointly with the NSW Police and the NPW Group, DECCW

Threats	Associated mitigation measures
Potential removal, damage of native vegetation and possibly disturbance-colonising threatened flora species due to maintenance of access roads and other routine activities	Implementation of threatened flora management procedure (Appendix E). Provide induction and species ID cards to all maintenance staff likely to encounter threatened flora (e.g. road maintenance staff, bush regenerators, gardeners, landscapers)
Establishment and spread of weeds due to increased visitation to the area.	Implement Weed Management Strategy (Appendix E). Access to surrounding bushland restricted to existing bushwalking tracks. Block off/ restrict access to unnecessary tracks through surrounding bushland by installing bollards/ large rocks and boulders (obstacles). No horse-riding permitted in the Plan area
Impacts on plants and vegetation communities as a result of too infrequent or too frequent fire	Fire management will be in accordance with the Bushfire Management Plan for the Plan area (GHD 2010e).
Loss of biodiversity values in the Plan area	Regular photos taken at identified and future post development photo points for the purposes of ongoing monitoring of conservation values in accordance with Item 1 y) of the Conservation Agreement (see Section 7.1; Appendix B). This will form the basis for decisions regarding ongoing management actions in consultation with DECCW.

5.2.4 Vegetation management procedures

Rehabilitation procedure

A rehabilitation management procedure has been prepared for implementation during the construction and operational phases of the development and is attached in Appendix E. In summary, this management procedure will aim to:

- Facilitate natural regeneration of areas during construction within Zone SP1 [the area surrounding infrastructure, as outlined in the Conservation Agreement (2010), (see Figure 2)] disturbed areas and closed access tracks;
- Assist rehabilitation through supplementary planting of native species of local provenance where natural regeneration is not feasible;
- Minimise the potential for erosion and sediment discharge from disturbed areas;

- Minimise the potential for weed establishment in disturbed areas;
- Supplement fauna foraging resources through replanting of native locally endemic species in landscaped areas, as required; and
- Minimise the potential for degradation of surrounding native bushland by invasive exotic species.

Rehabilitation activities (in particular the location of sites, selection of species and application of vegetative mulch) will be undertaken with consideration of the requirements for asset protection zones (APZ) and strategic fire advantage zones (SFAZ) identified in the Bushfire Management Plan (GHD 2010e). All activities will be undertaken in accordance with the Weed Management Strategy.

Threatened flora management protocol

A number of the threatened species identified as having the potential to occur on the site are known to germinate in disturbed areas such as road verges and the edges of clearings. There is potential therefore for these species to be impacted (if present) during the upgrade of maintenance tracks during the construction phase and routine maintenance of tracks during the operational phase of the development.

A threatened flora management procedure has been prepared for implementation during the construction and operational phases of the development and is attached in Appendix E. In summary, the management procedure aims to minimise the potential for adverse impacts on threatened flora (that may potentially occur) as a result of access track upgrade and maintenance activities through:

- Training personnel in the identification of threatened plant species; and
- Identifying appropriate management procedures to be implemented if plants are detected to avoid or minimise disturbance to individuals or populations.

5.3 Fauna and Habitat Management

The management of vegetation also has important consequences for fauna within the site and the surrounding areas, as it affects habitat resources and connectivity for a range of animals. The removal of vegetation for the proposed development has the potential to impact on fauna species both directly, through injury/mortality associated with vegetation clearing and construction activities; and also indirectly, through the removal or disturbance of habitat. There is also the potential for indirect offsite impacts on native fauna and their habitats as a result of the operation of the facility and environmental management activities undertaken throughout the wider plan area.

Fauna impact mitigation measures are outlined below for each phase of the development. Specific Management Procedures for the management of threatened fauna and habitat features on site are identified in Section 5.3.4 and detailed in Appendix E.

5.3.1 Pre-construction phase

The primary objective of fauna management measures to be implemented during the pre-construction phase is to minimise adverse impacts of construction activities on native fauna and their habitats. The key fauna management measures include:

- Targeted spring surveys for native fauna, including the Koala, microbats and forest owls in accordance with the Conditions of Consent for the Project. The surveys will be undertaken by Communities NSW's ecologists and will aim to detect additional species presence and confirm appropriate management procedures are contained within the EMP;
- The clear demarcation of the construction footprint to avoid unnecessary loss or disturbance of surrounding habitat during construction activities and to clearly define the area for pre-clearing surveys;
- Pre-clearing surveys undertaken by the contractor's ecologists to identify and mark:
  - habitat features (e.g. hollow-bearing trees, hollow logs and rock outcrops, wombat burrows, termite mounds) for inspection and for particular management during vegetation clearing activities to avoid or minimise the potential for harm to or mortality of resident fauna;
  - habitat features suitable for relocation in adjoining secure habitats;
  - hollow-bearing trees and/or Yellow-belled Glider feed trees to be retained in the vicinity of the proposed car park or along access roads, where possible; and
- the induction of site workers with respect to relevant Fauna Management Procedures to be implemented during the pre-construction and construction phases of the development.

An appropriately qualified ecologist (the contractor's ecologist) will be required to undertake the pre-clearing surveys as outlined above. Given the project timing constraints it is recommended that two to three ecologists be engaged by the contractor to undertake the pre-clearing surveys to expedite this management task.

Identified threats to fauna and fauna habitats and mitigation measures associated with the pre-construction phase are listed below. Specified Management Procedures are discussed in Section 5.3.4 and are attached in Appendix E.

Table 7 Fauna and habitat threats and mitigation during pre-construction phase

Threats	Associated Mitigation Measure
Accidental mortality, harm or disturbance of threatened fauna species	Targeted spring surveys undertaken by Communities NSW's ecologists to detect species presence and devise appropriate management procedures (see Appendix F). Implementation of Fauna Management Procedure and Fauna Handling Procedure (Appendix E)
Injured fauna/fauna mortality due to construction activities	Workforce to be inducted appropriately and educated regarding the management of native flora and fauna. The induction to cover all fauna and flora management procedures (see Appendix E). Enforcement of Management Procedures and appropriate behaviour (i.e. wildlife not be approached) by site manager.
Injury/mortality of individual animals from vehicles	Implement speed limits and erect fauna crossing warning signs to minimise potential for fauna mortality from vehicle collision
Loss of habitat through excessive construction footprint	Clearly demarcate the construction footprint with high visibility fencing. Position infrastructure (e.g. carpark, clubhouse) as far as possible in disturbed sites so as to minimise habitat impact. Identification and tagging of hollow-bearing trees and scarred sap feeding trees to be retained where possible in the car park site and in the vicinity of access roads that are to be upgraded as per Fauna Habitat Feature Management Procedure (Appendix E) Erect signs indicating environmental protection 'no go' zones outside the construction footprint within areas of retained native vegetation.
Habitat loss through removal or disturbance of hollow-bearing trees and other habitat resources.	Implement Fauna Feature Identification Management Procedure (see Appendix E). Identification of transportable habitat features (e.g. large hollow logs, bushrock) within the construction footprint for removal and reinstatement in surrounding bushland.
Fauna injury/mortality through disturbance of shelter sites	Implement Fauna Feature Identification Management Procedure (see Appendix E). Identification and tagging of habitat features that will need to be inspected prior to clearing for the presence of native fauna during

Threats	Associated Mitigation Measure
	vegetation clearing (e.g. hollow-bearing trees, rocky outcrops and ledges).
Decrease in Rosenberg's Goanna population following disturbance of nurseries.	Implement Fauna Feature Identification Management Procedure (see Appendix E). Inspection of termite mounds by the contractor's ecologists to identify potential nest sites. Inspection and egg retrieval if necessary by contractor's qualified herpetologist or wildlife specialist in consultation with DECCW.
Mortality or injury of wombats following removal or disturbance of burrows.	Identification of active wombat burrows within construction footprint and installation of 1-way gates by the contractor's ecologists (to be removed during clearing).
Increase in pest animal populations within and adjacent to the site following increased human activity (i.e. attracted to rubbish, food scraps).	Identify Pest Management as a management issue during the project induction, to illustrate to workforce the importance of appropriately disposing of rubbish and scraps. Appropriate management and regular removal of rubbish and organic waste from the construction site

5.3.2 Construction phase

The physical removal of vegetation through clearing to accommodate the proposed development will have unavoidable impacts on flora and fauna within the construction footprint. These impacts will be associated with risks of animals being injured or killed during vegetation clearing and the removal of habitat features. By reducing this footprint to the smallest area practicable and ensuring works and disturbance are confined to the identified footprints, vegetation (and therefore habitat) disturbance and/or loss and can be kept to a minimum. Potential impacts in this regard will also be minimised as far as possible through undertaking pre-clearing surveys during the pre-construction phase (as described above), the timing of construction activities and the implementation of particular Fauna Management Procedures.

Fauna management procedures have been developed and are to be implemented, to avoid or minimise the potential for harm or mortality of fauna species during the pre-construction and construction phases of the development (Appendix E). These are:

- Habitat Clearing and Hollow Tree Removal Management Procedure;
- Native Fauna Management Procedure;
- Fauna Handling Management Procedure; and
- Habitat Reinstatement Management Procedure.

Clearing of vegetation and fauna habitat will be undertaken in accordance with these management procedures and will involve in summary:

- Leaving hollow-bearing trees identified during the pre-clearing surveys and those occupied by Koalas to a second stage of clearing to increase the possibility of resident fauna relocating of their own volition prior to removing the trees.
- Inspection of habitat features identified during the pre-clearing surveys immediately prior to clearing and careful removal techniques to minimise the potential for injury or mortality of resident fauna;
- Ensuring an experienced wildlife specialist(s) is present to manage and retrieve/relocate any displaced wildlife during clearing activities;
- Relocating displaced fauna to suitable secure habitat in adjoining areas, organising for their appropriate care and treatment if required; and
- Reinstatement of fauna habitat features removed from the construction footprint in adjoining secure habitat.

A wildlife specialist(s) (with recognised skills in animal care and handling) must be engaged by the contractor to be present during all vegetation clearing activities and on call during subsequent construction activities. Given the habitat resources to be cleared and clearing timing constraints it is recommended that two wildlife specialists be engaged for attendance on site during vegetation clearing to minimise the potential for harm to fauna species and to expedite clearing activities. The wildlife specialist(s) will be responsible for the welfare of all animals encountered during the construction phase of the project, particularly animals sheltering in vegetation or habitat features which are to be cleared. Where necessary, assistance from a Veterinarian may also be required where distressed/injured animals are concerned.

The contractor's ecologist will be required to advise on the reinstatement of transportable habitat features in surrounding vegetation during the vegetation clearing.

Potential threats to fauna and habitat specific to the construction phase and proposed mitigation measures are outlined in Table 8. Management Procedures for the management of threatened fauna and habitat features on site are outlined in Section 5.3.4 and detailed in Appendix E.

Table 8 Fauna and habitat threats and mitigation during construction phase

Threats	Associated mitigation measures
Disturbance of nesting and breeding patterns due to inappropriate timing of clearing.	Clearance of vegetation to occur between June and October to avoid breeding and nesting period for many fauna species.
Disturbance of fauna outside of construction footprint due to noise and light disturbance from construction activities.	Construction works to occur during standard operational hours as far as possible. Use of flood lighting and night time work to be minimised. Lights to be positioned and directed to avoid light spill into areas of retained vegetation as far as possible
Risk of fauna injury or mortality during vegetation clearing and other construction activities	Qualified Wildlife specialist engaged by the contractor to be on site during tree-felling and general vegetation/habitat clearing and on call during the remainder of the construction phase.

Threats	Associated mitigation measures
	Implement Habitat Clearing and Hollow Tree Removal Management Procedure (Appendix E). Implement the Fauna Management and Fauna Handling Procedures for the safe and successful relocation of native fauna from the construction area by contractor's wildlife specialists (Appendix E)
Fauna mortality from machinery/vehicle movements	Exercise caution during road grading works and vehicle movement Enforcement of speed limits and maintenance of fauna crossing warning signs to minimise potential fauna mortality from vehicle collision.
Loss of habitat features	Avoidance of hollow-bearing trees and stags and glider sap-feeding trees during clearing of roads and carparks where possible (as identified by Contractor's Ecologist during pre-construction phase). Implement Fauna Habitat Feature Reinstatement Management Procedure for removal of hollow trees and logs and rocks identified and tagged during the pre-clearing surveys from construction areas and their reinstatement in surrounding habitats to maintain habitat resources for fauna species (under the guidance of contractor's ecologist). (see Appendix E) Use of Koala and Yellow-bellied Glider food trees in rehabilitation/landscaping areas in accordance with Rehabilitation Management Procedure (Appendix E).
Impacts on fauna and fauna habitats as a result of bushfire	Management of construction activities in hot conditions in accordance with provisions of the CEMP and the requirements of the SHRSC Bushfire Management Plan
Disturbance of Broad-headed snake habitat on edges of construction areas during construction activities.	Caution to be exercised when working around potential Broad-headed snake habitat (i.e. exposed sandstone and bushrock) adjoining construction areas identified during pre-clearing surveys.

5.3.3 Operational Phase

Once construction activities have ceased, the potential for direct impacts on fauna and habitats will be reduced. Nevertheless, there is the potential for indirect offsite impacts on native fauna and their habitats

as a result of the operation of the facility and these will have to be appropriately managed. Access, including that to undertake ongoing environmental management activities within the wider Plan area, such as weed, pest and bushfire control, as well as that for recreational purposes, also has the potential to result in adverse impacts on fauna and fauna habitats in the wider Plan area.

The Operational Environmental Management Plan (OEMP) for the SHRSC will detail specific mitigation measures incorporated from this EMP and the Soil and Water Management Plan, Water Cycle Management Plan and Bushfire Management Plan to minimise the potential for indirect off-site impacts on fauna and their habitats.

Weed control will also be undertaken in the SP1 zone by professional bush regenerators in accordance with the Weed Management Plan and the Conservation Agreement (2010). It is intended that weed and pest control in the Plan area will be integrated with PWG (Nattai area) weed and pest management within the surrounding DECCW estate under the MOU between the PWG and Communities NSW (Sport and Recreation).

A Bushfire Management Plan has been prepared for the Plan area (GHD 2010e). It addresses the biodiversity conservation goals of bushfire management within the Plan area to and aims to maintain fire regimes that are appropriate and necessary to conserve the environmental values of the area.

Threats and mitigation measures relevant to fauna and fauna habitats in the operational phase are described in Table 9.

Table 9 Fauna and habitat threats and mitigation during operational phase

Threats	Associated mitigation measures
Fauna injury/mortality due to vehicle movements.	Introduction of speed limits, speed control structures (such as speed bumps) and appropriate warning signs on public roads outside of the site.
Fauna injury due to shooting activities.	Implementation of Fauna Management and Fauna Handling Procedures with respect to operational activities (Appendix E).
Disturbance to nocturnal species, due to noise and light associated with night-time shooting activities and site access.	Nocturnal shooting activities to be kept to a minimum. Lights to be located and directed so as to avoid as far as possible light spill into surrounding habitats.
Introduction or increase in feral predators	Appropriate management and regular removal of wastes and rubbish Management of feral pests in collaboration with PWG (see Section 5.6)
Introduction of weeds	Implementation of Weed Management Strategy (Appendix E) Management of weeds in collaboration with PWG (see Section 5.4)
Impeded movement of fauna due to the location of	Removal of all non-essential fencing

Threats	Associated mitigation measures
fencing.	following construction to allow movement of fauna through habitats surrounding the site
Lead poisoning of fauna due to ingestion of spent munitions.	Implementation of Soil and Water Management Plan and regular removal of spent munitions. Collection and analysis of fauna carcasses for lead or heavy metal contamination (where the opportunity arises)
Impacts on water quality through sedimentation changes to groundwater and chemical contamination	Mitigation, monitoring and management in accordance with the Soil and Water Management Plan and Water Cycle Management Plan (see Sections 5.8 and 7.5).
Impacts on native vegetation due to soil contamination from spent ammunition	Mitigation, monitoring and management in accordance with the Soil and Water Management Plan and Water Cycle Management Plan (see Sections 5.8 and 7.5)
Disturbance of fauna and potential degradation of habitats due to increased visitation to site	Access to surrounding bushland restricted to existing bushwalking tracks, which should be clearly posted. Close unused/unwanted tracks through surrounding bushland and rehabilitate, using natural regeneration where possible.
Loss of habitat resources through the illegal removal of bushrock	Management of this issue to be undertaken in the Conservation Zone in consultation with DECCW, in line with existing practices for the surrounding Bargo Conservation Area. Management of illegal vehicle access considerations will be undertaken jointly with the NSW Police and the NPW Group, DECCW The removal of bush rock or other fauna or flora items from the site will be an offence under Regulations issued pursuant to Section 40(1) of the Sporting Venues Authorities Act. Rangers appointed by the Director General, Communities NSW are empowered to enter the site to detect and act on any illegal activity.
Impacts on fauna and fauna habitats as a result of too infrequent or too frequent fire	Fire management will be in accordance with the Bushfire Management Plan for the Plan area (GHD 2010e).
Loss of biodiversity values in the Plan area	Regular photos taken at identified and

Threats	Associated mitigation measures
	future post development photo points for the purposes of ongoing monitoring of conservation values in accordance with the Conservation Agreement (see Section 7.1). This will form the basis for decisions regarding ongoing management actions in consultation with DECCW.
Loss of vegetation biodiversity values through invasion of native vegetation by invasive species introduced to site	Implement Rehabilitation Management Procedure (see Appendix E). Use of endemic plant species of local provenance in areas requiring revegetation and sterile, non-invasive turf for grassed areas.

5.3.4 Fauna management procedures

A range of fauna management procedures have been developed and are to be implemented during the pre-construction and construction phase of the development to minimise the potential for harm to, or mortality of native fauna species. These Management procedures are summarised below and detailed in Appendix E.

- *Habitat Feature Identification Management Procedure*

This Management Procedure is to be implemented during pre-clearing surveys in the pre-construction phase of the development. It outlines the process and timing for the identification and marking of fauna habitat features to be retained (where possible), those to be inspected and subject to particular management during vegetation clearing activities, and those suitable for relocation in adjoining secure habitats. Identified management tasks under this procedure are to be undertaken by qualified ecologists engaged by the contractor ('contractor's ecologists').

- *Habitat Clearing and Hollow Tree Removal Management Procedure*

This Management Procedure is to be implemented during the construction phase and outlines the process and timing for the removal of hollow-bearing trees and other habitat features (including wombat burrows, rock outcrops and termite mounds) identified during the pre-clearing surveys and trees occupied by Koalas to minimise the potential for harm to or mortality of occupant fauna. Identified management tasks under this procedure are to be undertaken by qualified ecologists ('contractor's ecologists') and wildlife specialists ('contractor's wildlife specialists') engaged by the contractor.

- *Native Fauna Management Procedure*

This Management Procedure is particularly relevant for the management of fauna encountered during the construction phase of the development but is also relevant for fauna management on the development site once operational. The procedure outlines protocols to encourage fauna to vacate sites where they are in danger of injury or mortality or for their safe retrieval and relocation into areas of adjoining secure habitat (if required). Identified management tasks under this procedure are to be undertaken by wildlife specialists either engaged by the contractor ('contractor's wildlife specialists') during the construction phase or by the site manager during the operational phase.

- *Fauna Handling Management Procedure*

This procedure outlines the process for the retrieval of native fauna where animals are in distress, injured or in danger of injury or deceased. Procedures for the appropriate capture, temporary holding and relocation of fauna species are detailed along with instructions for the care and management of injured or deceased individuals. Fauna handling is to be undertaken by qualified Wildlife Specialist(s) and all activities documented for inclusion in environmental reporting.

- *Habitat Feature Reinstatement Management Procedure*

Hollow logs and other large woody debris and large rocks identified during the pre-clearing surveys are to be removed from the construction footprint and redistributed in adjoining secure habitat under advice from the contractor's ecologist. This will minimise the removal of dead wood, which has been listed under the TSC Act as a key threatening process, as well as other habitat features that provide refuge and foraging habitat for native fauna

5.4 Weed Management

The introduction of weeds can have significant impacts on the structure and function of local ecosystems, by altering species composition, nutrient cycling, light dispersal, fire regimes and by outcompeting or inhibiting the growth of native flora (Vitousek *et al*. 1997). They can also impact on native fauna by altering habitat foraging resource availability.

The vegetation within the site is currently intact and largely undisturbed, with no weed species recorded within survey quadrats in native vegetation in the proposed development area (GHD 2008). Weed species do occur in the wider locality such as along road verges approaching the site.

The proposed development has the potential to introduce and allow the spread of weeds within the site and onto adjacent land. Disturbance and clearing of native vegetation creates opportunities for weedy and non-native species to establish (Hobbs and Huenneke, 1992). The impacts from 'edge effects' (including altered light levels, moisture distribution and disturbance frequency) along roads and around permanent infrastructure also promote conditions favourable to the establishment of these species. Seeds and propagules of these species are more likely to be imported onto the site as traffic associated with construction and operation of the complex increases: seeds may be attached to equipment, to wheels or exteriors of vehicles, or to the shoes and clothes of personnel and visitors. Weeds may also be transmitted on vehicles undertaking routine environmental management activities (eg bushfire control activities) through the Plan area and on the clothing and footware of recreational users.

The following measures are also to be implemented to mitigate potential impacts of weeds on native vegetation and habitats within the Plan area and are consistent with item 1 (a) of the Conservation Agreement for Lot 100, DP 1088254:

- Implementation of a Weed Management Strategy considering the following:
  - Removal and Control of noxious weeds, using appropriate methods and timing; and
  - Reduction of edge effects and invasion of exotic species into adjacent vegetation;
- Weed species to be monitored on an annual basis by professional bush regenerator;
- All weed management activities to be undertaken by qualified bush regenerators using established bush regeneration techniques;

- Every reasonable precaution will be taken to avoid introducing or encouraging the proliferation of noxious weeds or other undesirable and non-indigenous plants; and
- Any new infestations of weeds will be eradicated or controlled as soon as practical, consistent with NSW Government weed eradication procedures and *Noxious Weeds Act* as applicable and as outlined in the Weed Management Strategy.

It is intended that weed control in the Plan area will be integrated with PWG (Nattai area) weed management within the surrounding DECCW estate under the MOU between the PWG and Communities NSW (Sport and Recreation).

Mitigation measures to be incorporated into the Weed Management Strategy and implemented during the phases of the development are described below.

5.4.1 Pre-construction phase

There is potential for the proposed development to increase the potential for weed introduction and subsequent spread. While these impacts are related more to the construction phase of the project there is also the potential for weed introduction along access tracks throughout the Plan area. Quantifying weed presence in the SP1 zone before construction activities commence will provide a useful benchmark for post-construction weed management (i.e. during the operational phase).

Threats and mitigation measures to be implemented during the pre-construction phase are identified in Table 10.

Table 10 Threats and mitigation associated with weed invasion during the pre-construction phase

Threats	Associated mitigation measures
Increased abundance of weeds during construction and operational phase	Contractor's ecologists to survey and map existing weeds within the vicinity of construction sites and adjoining areas of native vegetation during pre-clearing surveys to identify current baseline weed levels, to inform future management and to enable comparison of pre- and post-construction environment. Communities NSW to take photos at established biodiversity value photo points and establish, log and photograph new photo points adjoining the development areas as per Conservation Agreement.
Potential for introduction and spread of weeds due to site activity	Provide induction to familiarise contractor workforce with Weed Management Strategy

5.4.2 Construction phase

Construction activities have the potential to introduce and spread weed species. It is important for the protection of the high biodiversity values present in the Plan area and adjoining lands that weed introduction and spread does not occur.

The primary mitigation measure to be implemented for the control of weed species in the SP1 area is the implementation of a Weed Management Strategy (see Appendix E) and the management of soil and water on site in accordance with the Soil and Water Management Plan and Watercycle Management Plan (GHD 2010b, c).

Threats and specific mitigation measures incorporated in the weed management strategy and implemented during the construction phase are identified in Table 11.

Table 11 Threats and mitigation associated with weed invasion during the construction phase

Threats	Associated mitigation measures
Introduction of weeds onto the site and spread into adjacent areas due to vehicle and people movement	Use of designated site entry points to minimise interaction with surrounding areas Vehicle movement restricted to access roads and construction areas as far as possible. Wash down stations with high pressure hoses to remove mud that may potentially contain seeds/burs to be established at access points. Seeds, burrs or plant material must be removed from clothing, footwear, equipment and vehicles before entering the site. Log book to be maintained to record this activity.
Establishment of weeds due to soil disturbance.	Minimise the construction footprint and soil and vegetation disturbance as far as practicable Retained mulch material (native vegetation) to be spread on exposed soils following construction activities Progressively stabilise and rehabilitate any disturbance to the natural environment during construction in accordance with Rehabilitation Procedure and Weed Management Strategy (Appendix E)
Establishment of weeds in soil stockpiles.	Management of soil stockpiles to prevent weed germination in accordance with Soil & Water Management Plan Place stockpiles that may contain seed or

Threats	Associated mitigation measures
	propagules of weeds away from vegetated areas or drainage lines to prevent spread of weeds during rainfall events
Transport of weed propagules in runoff	Implement Soil & Water Management Plan

5.4.3 Operational phase

Following construction activities, the operational phase poses a threat of introducing weeds. Soil exposed during construction activities (i.e. in construction phase) can be readily colonised by weedy species and unless native rehabilitation is carried out successfully, weed species have the potential to establish. As noted above, there is also a potential for weeds to be introduced through access for environmental maintenance activities and due to an increase in recreational visitors to the site. The identified threats and proposed mitigation measures to control the introduction and spread of weeds during the operational phase are identified in Table 12.

Table 12 Threats and mitigation associated with weed invasion during the operational phase

Threats	Associated mitigation measures
Weed establishment on disturbed soils within the construction area and adjoining vegetation	Completion of annual weed surveys by bush regenerator, to compare the pre (zero or negligible weeds) and post construction environments. Weed control as required according to the Weed Management Strategy undertaken by professional bush regenerator, as per the Conservation Agreement (2010).
Introduction of weeds through ongoing pedestrian/ vehicle movement and access to the site.	Vehicular traffic restricted to designated access roads and parking areas. Access to surrounding bushland limited to existing bushwalking tracks, which should be clearly signposted. Block off/ restrict access to tracks through surrounding bushland by installing bollards/ large rocks and boulders (obstacles). Rehabilitate unused/unwanted tracks via natural regeneration method, supplement with plantings if required.
Introduction of weeds through use of inappropriate species in landscaped areas around clubhouse and carpark facilities	Implement Rehabilitation Management Procedure (Appendix E) Any landscaping or assisted regeneration at the site will be undertaken using native plant species of local provenance Use of non-viable, non-invasive turf in grassed areas

Threats	Associated mitigation measures
Spread of weeds throughout Plan area	Completion of annual weed surveys by bush regenerator, to compare the pre (zero or negligible weeds) and post construction environment. Photos will be taken at the established photo points to compare with pre-construction conditions (as per Conservation Agreement). Weed control as required according to the Weed Management Strategy undertaken by professional bush regenerator, as per the Conservation Agreement (2010). Implementation of weed control procedures integrated with existing PWG (Nattai area) practices within the surrounding DECCW estate

5.5 Biosecurity Management

This section details measures to protect existing biodiversity values, by guarding against the introduction and spread of pathogen/diseases within the site.

Potentially relevant threats addressed in this section are:

- Phytophthora (*Phytophthora cinnamomi*); and
- Amphibian Chytrid Fungus

There is no evidence of either Phytophthora (*Phytophthora cinnamomi*) or Amphibian Chytrid Fungus on the subject site, nor is either pathogen currently acknowledged as being present within the Bargo State Conservation Area (NPWS 2001, A. Johnston DECCW pers. comm.). However the Hawkesbury Nepean Catchment Management Authority (2008) lists an occurrence of Phytophthora in Thirlmere Lakes National Park, and both pathogens may persist undetected in an area for considerable periods.

Inadequate biosecurity management during the construction and associated works program, including earthworks, weeding and monitoring activities, has the potential to lead to the establishment and spread of Phytophthora, resulting in a decline of vegetation (in particular Myrtaceae, Proteaceae and Epacridaceae species) and associated habitat values.

Similarly, without stringent controls in place, Amphibian Chytrid Fungus (*Batrachochytrium dendrobatidis*) has the potential to be introduced and spread, causing a decline in frog populations. The introduction of this pathogen is less of a threat than the spread of Phytophthora as the project will have minimal impact on frog habitats such as waterbodies and creek lines. However, there is a potential for its introduction during activities such as monitoring of contamination levels of ponds on the site.

Potential threats and measures to protect existing biodiversity values, by guarding against the introduction and spread of the pathogens/ diseases discussed above are identified in Section 5.5.3. Mitigation measures apply to all phases of the project.

The strategies outlined in this section have been prepared with reference to the following documents:

- *Threat Abatement Plan for dieback caused by the root-rot fungus* Phytophthora cinnamomi (DEH 2001)
- 'Background document for the threat abatement plan', *Disease in natural ecosystems caused by* Phytophthora cinnamomi (DEWHA 2007)
- *Managing Phytophthora Dieback: Guidelines for Local Government* (Dieback Working Group 2000);
- *Best Practice Management Guidelines for* Phytophthora cinnamomi *within the Sydney metropolitan Catchment Management Authority Area*. Botanic Gardens Trust (Suddaby and Liew 2008);
- *Threat Abatement Plan: Infection of amphibians with chytrid fungus resulting in chytridiomycosis* (DEH 2006a)
- Background Document for the '*Threat Abatement Plan: Infection of amphibians with chytrid fungus resulting in chytridiomycosis*' (DEH 2006b); and
- *Hygiene protocol for the control of disease in frogs* (DECC 2008a).

5.5.1 Phytophthora

Phytophthora is a soil-borne pathogen infecting plant roots and underground tissue. Symptoms of the infection vary from reduced growth in host species to complete plant death. Phytophthora infection can have serious consequences for biodiversity, by exterminating local populations of susceptible flora species and removing habitat for fauna.

Phytophthora is widespread in coastal areas, and may persist in areas for extended periods before any symptoms are observed. The pathogen exists in soils and soil water, and thrives in areas where annual rainfall exceeds 600 mm, where soil nutrients and leaf litter are low or where fire has reduced levels of soil organic matter. Anaerobic conditions in moist soils and a lack of surface biomass prevent breakdown of the pathogen by soil micro organisms. New plant growth is susceptible to infection and the effects may be substantial in plants already affected by drought, waterlogging or fire stress.

The pathogen is listed as a 'Key Threatening Process' under both the NSW TSC Act and the Commonwealth EPBC Act. In NSW, phytophthora is considered to threaten the conservation of a number of threatened flora species as well as fauna species due to a loss in habitat and food resources (O'Gara et al. 2005).

Symptoms of Phytophthora Infection

The effects of phytophthora infection vary between host species. Infection of root tips may result in root-rot and eventual disintegration of the growth tip, reducing the host's ability to absorb water and nutrients. Visual signs of infection present as discolouration of leaves and death of affected plant parts.

Transmission of Phytophthora

Transport of waterborne phytophthora spores and vegetative mycelia occurs during rainfall events and as runoff both through the soil profile and in surface flows. Phytophthora infection downstream of an existing infestation is therefore common.

Spread of the pathogen within soil occurs as infected plant roots come in contact with adjacent plants. Mechanical damage of infected material and removal of infected plant tissue can spread the pathogen to other areas. Transferral of infected soil may occur through animal movement, pedestrian or vehicular traffic.

5.5.2 Amphibian chytrid fungus

The Amphibian Chytrid Fungus is highly infectious pathogen that leads to the skin disease chytridiomycosis in a wide range of amphibians worldwide.

Amphibian Chytrid Fungus flourishes in relatively cool (6-28 degrees Celsius) and moist conditions. Susceptibility to chytridiomycosis varies between frog species, with unaffected and drastically declining species often coexisting. Factors such as ambient temperature, elevation, microhabitat selection and chemical skin defences have been shown to alter the severity of infection but the importance of these factors appears to be highly variable across populations and species (Rowley 2006).

Amphibian Chytrid Fungus, resulting in the disease chytridiomycosis, is listed as a Key Threatening Process under both the NSW TSC Act and the Commonwealth EPBC Act. The Commonwealth Threat Abatement Plan for chytrid (DEH 2006a) focuses on quarantine procedures to prevent further spread and promoting research into an effective method of treating the infection in the wild.

Symptoms of Chytrid Infection

The effects of chytrid infection vary between frog growth stages. Chytrid infection occurs only in keratinised skin, which at the tadpole stage occurs only in the mouthparts. Infection in tadpoles occurs and can be detected by malformed mouthparts, but it appears not to be fatal at this stage. However once the tadpole metamorphoses the entirety of the skin becomes keratinised, allowing the infection to spread (Berger et al. 1999).

Typical symptoms of Australian frogs with chytridiomycosis include lethargy, loss of appetite, skin discolouration, presence of excessive sloughed skin, and sitting unprotected during the day with hind legs held loosely to the body (Berger et al 1999). The exact mechanism by which chytrid leads to the death of frogs is still unknown, but recent research suggests that it operates by disrupting the osmoregulatory function of the skin, leading to an imbalance of electrolytes and ultimately to cardiac arrest (Voyles et al. 2009).

Transmission of Chytrid

Chytrid is spread by the transmission of spores and is thought to be able to persist in moist environments without amphibian hosts (DEH 2006b). Transfer of spores may occur through pedestrian or vehicular traffic as well as contaminated equipment associated with aquatic recreation and surveys (DEH 2006b). These surfaces can be decontaminated through the use of desiccation, heat or chemical disinfectants (see Johnson et al. 2003).

Once the fungus has established in an area it is almost impossible to remove, and there is a high likelihood that local amphibian populations will become infected and spread the infection to surrounding areas. There is currently no effective method for treating infected populations in the wild, and the most effective measure against chytrid is to prevent its spread from infected to uninfected populations (DEH 2006b).

5.5.3 Threats and mitigation measures

Phytophthora is not currently acknowledged as being present within the Bargo State Conservation Area (NPWS 2001, A. Johnston pers. comm.); however the Hawkesbury Nepean Catchment Management Authority (2008) lists an occurrence of the pathogen in Thirlmere Lakes National Park.

Phytophthora infection is currently incurable and once an area is affected transmission to other plants in the community is likely. Prevention of transmission is based on methods to restrict transport of infected plants and soil between areas (DEH 2004 & 2006).

There are currently no reports of chytrid infection within the site or in the adjacent Bargo State Conservation Area (NPWS 2001, A. Johnston pers. comm.), however the infection may be present but undetected.

Chytrid infection is currently incurable and once a habitat or population is affected transmission to other frogs in the community is likely. Management of chytrid on site will therefore focus on preventing the introduction and spread of the fungus. Prevention of transmission is based on methods to restrict transport of spores found on infected tadpoles, frogs and water between the site and adjacent land (DEWHA 2004 & DECC 2008a).

The following threats and required mitigation measures identified in Table 13 apply to all phases of the project.

Table 13 Threats and mitigation procedures for pathogen/ disease control for all stages of the project

Threats	Associated mitigation measures
Risk of introduction of Phytophthora in soil on construction and maintenance and monitoring equipment, wheels of vehicles (including fire trucks) and shoes (visitors, bushwalkers, bush regeneration contractors).	Implement Biosecurity Management Procedure (Appendix E). Establish foot and vehicle/machinery washdown and disinfectant sites Access to surrounding bushland restricted to existing bushwalking tracks - block off access to tracks through surrounding bushland by installing bollards/ large rocks and boulders (obstacles). Clearly demarcate walking trails. Installation of signs along access ways, entry and exit points. Vehicles restricted to designated access tracks and parking areas.
Increased risk of Phytophthora infection due to vegetation and soil disturbance	Minimising disturbance of soil and vegetation through clear demarcation of the construction area and restricted access to the E2 environmental conservation zone
Increased risk of Phytophthora infection from imported materials	Any imported soil or raw material must be sourced from disease free areas. Any water used for irrigation or fire fighting to be sourced from phytophthora-free areas.
Decreased flora diversity due to Phytophthora infection and dieback, and impact on fauna species due to decline in habitat and resources.	Implement measures to prevent the spread of Phytophthora, as above. Undertake Phytophthora monitoring

Threats	Associated mitigation measures
	(Section 5.5.5).
Introduction of Amphibian Chytrid Fungus via contaminated construction equipment, vehicles, shoes, water or raw materials, water quality monitoring equipment).	Adoption of Biosecurity Management Procedure (Appendix E) i.e. equipment, footwear and vehicle tyres to be cleaned and disinfected. Water quality monitoring equipment in particular should be cleaned and disinfected between sample sites. Restricted access to frog breeding areas, including water bodies and creeks. Access to surrounding bushland to be restricted to current bushwalking tracks. Vehicles to be restricted to designated access tracks and parking areas.
Increased mortality of amphibian species due to poor hygiene practices	Frogs are to be handled only by a qualified ecologist or wildlife specialist Use of disposable gloves and sterile equipment at all times Implementation of the NPWS Frog Hygiene Protocol (DECC 2008a)

5.5.4 Biosecurity management procedure

The implementation of hygiene standards to prevent the introduction and spread of pathogens and weeds is a requirement of approval according to the Determination of Major Project No 06_0232 (DoP 2010). A biosecurity management procedure has been prepared for the Plan area and is provided in Appendix E. The purpose of the management procedure is to minimise the potential for the introduction and spread of Phytophthora and Amphibian Chytrid Fungus. The protocol aims to achieve this by prescribing hygiene standards for all footwear, equipment and vehicles entering and exiting the site.

The biosecurity management procedure is to be adhered to during the pre-construction and construction development phases and for all environmental management and maintenance activities (machinery and workforce) required during the operational phase of the project (see Appendix E).

5.5.5 Phytophthora monitoring

The development and implementation of a program for Phytophthora monitoring within the site is a condition of approval for the project according to the Determination of Major Project No 06_0232 (DoP 2009). There is currently no monitoring program for Phytophthora within the Bargo SCA (Adrian Johnson DECCW pers. comm. 2009).

The following monitoring and management actions are to be applied in the Plan area:

- Surveys for phytophthora dieback be undertaken across the site every 1-2 years

- Surveys should be carried out by appropriately qualified bush regenerators with Phytophthora experience. It is recommended that surveys be carried out in conjunction with annual weed monitoring and control activities (Section 5.4)

- Dieback surveys should look for signs including (taken from Dieback Working Group 2000):
  - Death of susceptible plant species (indicator species- refer to O'Gara et al (2005))
  - Total plant deaths- dieback kills plants completely and quickly
  - An age range in deaths, i.e. old and recent deaths (phytophthora spreads from one plant to the next)
  - A vector that could have introduced the disease (e.g. road or walking track)
  - Other factors that could have caused plant death
- If dieback is suspected, soil and plant samples should be taken for analysis to check for the presence of Phytophthora.
- If an area is found to be infected, access to the area should be prohibited and a management plan implemented to control dieback and prevent the spread of the disease in consultation with local National Parks officers. This management plan may include:
  - The use of Phosphite fungicide on unaffected plants in the vicinity, to increase resistance to phytophtora spread
  - Implementation of appropriate hygiene protocols
  - Permanent restriction of access to area
  - Installation of signs around infected area
- Hygiene protocols must be implemented for working in or entering infected areas, including the cleaning and disinfection of all footwear, equipment and vehicles when moving from infected to uninfected areas.

5.6 Pest Animal Management

Introduced animal species can impact on local environments through predation, grazing, competition, habitat alteration and as vectors for introduced diseases and parasites. Exotic predators have already had a huge impact on Australia's biodiversity, and 14 of the 35 Key Threatening Processes identified under the TSC Act involve predation or competition from feral animals, including:

- Competition and grazing by the feral European Rabbit (*Oryctolagus cuniculus*);
- Predation by feral cats (*Felis catus*);
- Predation by the European Red Fox (*Vulpes vulpes*); and
- Predation, habitat degradation, competition and disease transmission by Feral Pigs (*Sus scrofa*).

Disturbed areas are often more vulnerable to the invasion and spread of exotic species. The introduction of disturbed edges and grassy clearings provides favourable habitat for species, including the European Rabbit, while other exotics such as Black Rats (*Rattus rattus*) and the House Mouse (*Mus musculus*) are markedly more abundant in residential and agricultural areas. The construction of access roads and disturbance of habitats is thought to facilitate the invasion of feral species such as Feral Cats and European Red Foxes, by increasing the ease of access and foraging efficiency for these species (May and Norton 1996).

The PWG, DECCW is involved in a cooperative program with the Rural Lands Protection Board (RLPB) for the control of feral animals. The NPW Group has a contract with Moss Vale RLPB to control feral animals in the National Parks and Nature Reserves within this Shire. The primary feral animals targeted for control by NPWS and RLPB are pigs, wild dogs, goats and foxes. However, other feral animals such as rabbits are also controlled. Council has also initiated a feral animal control program in five Council owned bushland reserves.

Feral animal control in the Plan area will be undertaken in partnership with the Rural Lands Protection Board and consistent with Item 1 (b) of the Conservation Agreement for Lot 100, DP 1088254 and will be integrated with existing management within the surrounding DECCW estate under the MOU between the PWG and Communities NSW (Sport and Recreation). Additional controls may be undertaken if required with advice from local PWG officers as appropriate.

In addition to the above, monitoring of rabbit activity within the cleared firing ranges will be undertaken involving monthly searches, noting the presence of this pest species through grazing, burrowing or pellets. Any observed increase in activity will be reported and a management plan prepared in consultation with NPW officers to prevent the further spread of this species, if required.

No poultry, pigs, horses or other livestock nor any dog, cat or other domestic or exotic animal to be brought onto or kept in the plan area. No beehives will be permitted.

The following sections identify measures to minimise impacts of feral pests on biodiversity by ensuring the project does not increase the effects of pest animals on the site or adjoining lands.

5.6.1 Pre-construction and construction phases

There is potential for an increase in the presence and impacts of pest animals within and adjacent to the site as a result of construction activities. There are few threats associated with the pre-construction phase of the project and as a consequence, pre-construction and construction phases of the project are discussed together below:

Table 14 Threats and mitigation measure for pest animals during pre-construction and construction phases of the project

Threats	Associated mitigation measures
Increase in pest animals on site and in adjacent areas due to vegetation and habitat disturbance and creation of suitable habitat.	Identify pest animals as a management issue during the project induction and the appropriate handing and disposal of wastes Minimise vegetation disturbance within the construction footprint
Increased access for pest animals through construction of additional access roads and clearings	Minimise clearing of vegetation Close and revegetate unwanted tracks in surrounding bushland, using natural regeneration techniques as far as possible

5.6.2 Operational phase

The project may increase the presence and impacts of pest animals within and adjacent to the construction site during the operational phase of the development. Threats and mitigation measures include:

Table 15 Threats and mitigation measure for pest animals during the operational phase of the project

Threats	Associated mitigation measures
Increase in pest animals from site disturbance, human activity etc creating habitat/ food resources preferential for pest animals.	Regular waste disposal to prevent encouragement of pest animals to the site.
Impacts on native fauna species through predation and competition by pest animals.	Implementation of feral animal control procedures integrated with existing PWG (Nattai area) practices within the surrounding DECCW estate Additional control programs to be undertaken if necessary, with advice from local National Parks officers and Rural Lands Protection Board.
Inhibiting success of rehabilitation works due to European Rabbit grazing pressure.	Installation of tree guards/ protective fencing to separate regenerating vegetation from Rabbit grazing. Monthly rabbit monitoring (noting presence through grazing, burrowing or pellets). Any observed increase in activity will be reported to inform a Management Plan. Plan to be prepared in consultation with NPW officers to prevent the further spread of this species, if required, if required. Control programs for European Rabbits to be undertaken if necessary, with advice from local National Parks officers and Rural Lands Protection Board

5.7 Fire Management

Fire is an integral component of the Australian bush, it plays an important part in promoting germination of certain species, and also aids in creating hollows for wildlife. However, too frequent or too infrequent fires can have a detrimental impact on both vegetation and fauna communities. Inappropriate fire regimes have been identified as a key threatening process that may impact on biodiversity values or the loss of vegetation structure or composition in an area. Fire regimes are a function of fire frequency, intensity, seasonality and type of fire (Gill et al. 2002).

The area is prone to fire, and due to the rugged topography, extensive uninterrupted bushland and dense vegetation, fire control is often problematical. As such, the management of fire at the site, including

hazard reduction burns and bushfire can have significant consequences for native vegetation and fauna habitats at the site.

There are no areas within the Southern Highlands Regional Shooting Complex that are currently subject to fire regimes that are 'too frequent'. There are parts of site however where application of a more frequent fire interval is required to reduce fuels and the likelihood of fires leaving the site. Large parts of the site have not been burnt for a decade and significant areas for more than 20 years.

In the past, the PWG (Nattai area), DECCW was responsible for fire management in the area in collaboration with the Local Wingecarribee Bushfire Committee. It is anticipated that these authorities will have a role in fire control in the area (see below).

A Bushfire Management Plan has been prepared for the Plan area (GHD 2010e). It addresses the life and property protection, operational capability, and biodiversity conservation goals of bushfire management within the planning area and addresses of the Conservation Agreement for Lot 100, DP 1088254 (See Appendix A).

The implementation of the plan will assist in reducing the residual risk to site users and assets.

The primary objectives of bushfire management and mitigation are to:

a) Protect human life;

b) Protect assets before, during and after the passage of destructive bushfires;

c) Minimise the physical and environmental impact of bushfires;

d) Provide for bushfire protection work to be undertaken in an environmentally sustainable and cost effective manner; and

e) Maintain fire regimes that are appropriate and necessary to conserve environmental values.

It is important that appropriate fire regimes are identified and applied and fire management prescriptions for vegetation types and threatened species implemented to maintain the natural heritage values of the Plan area. The Bushfire Management Plan (GHD 2010e) contains recommended fire intervals and management prescriptions for the vegetation and threatened species known or which may potentially occur in the Plan area based on generic fire frequency guidelines for vegetation formations generally across NSW (NSW RFS 2006b) developed by the NSW National Parks and Wildlife Service, in conjunction with the NSW Rural Fire Service.

It is intended that fire management in the Plan area will be integrated with existing programs for the surrounding DECCW estate (as appropriate) under the MOU between the PWG and Communities NSW (Sport and Recreation).

Prescribed burning will be undertaken consistent with the requirements of the Bushfire Management Plan Alternative methods to encourage the recruitment of priority species will be explored in areas where it is not possible to undertake large scale ecological burns.

No new permanent fire trails will be constructed. Bushfire suppression operations may require the construction of temporary trails, helipads and fire lines. These will be closed and rehabilitated as part of post fire operations.

5.8 Contamination and Off-site Impacts

There is the potential for contamination as a result of the operation of the shooting range to result in indirect adverse impacts on native flora and fauna and their habitats surrounding the development area. These issues may include, but are not limited to:

- Impacts on native fauna through ingestion of spent ammunition;
- Impacts on water quality through increased sedimentation from exposed surfaces, changes to groundwater and chemical contamination from operational procedures; and
- Impacts on native vegetation due to soil contamination from spent ammunition.

Detailed mitigation measures for reducing and controlling the potential off-site impacts of contamination as a result of shooting range activities are addressed in the Soil and Water Management Plan and Water Cycle Management Plan (GHD 2010b, c). These will be implemented under the OEMP for the SHRSC. Specific mitigation measures include:

- Engineering and design features to provide for bullet and shot containment;
- Appropriate stormwater management, including sedimentation ponds;
- Upgrading existing wastewater management systems;
- Permanent erosion control;
- Application of soil amendments;
- Regular removal of spent munitions and contaminated soil remediation; and
- The implementation of long-term monitoring programs to be implemented at the site to monitor possible metal accumulation and migration from the site as outlined in Section 7.5.

5.9 Access

The following management actions will apply to the Plan area with respect to access:

- Illegal vehicle access will be managed jointly with the NSW Police and the NPW Group, DECC
- A review of illegal access mitigation will be undertaken jointly with NSW NPW Group, DECC and NSW Police to identify and then implement new gates or fences to restrict vehicle access to the plan area;
- No internal tracks will be provided connecting the 800m rifle range and new ranges to the west. In addition, subsequent to development of the new shooting ranges and provision of internal roads and access tracks, no new roads or tracks will be built within the area except for emergency fire management. Access tracks and internal roads will be maintained to ensure all-weather access for four-wheel driver vehicles;
- Trees and other vegetation will only be lopped, felled or removed where an actual or potential menace to approved operations occurs or where they are obstructing necessary access and it is not possible to deviate the access route around them; and
- The removal of bush rock or other fauna or flora items from the site will be an offence under Regulations issued pursuant to Section 40(1) of the Sporting Venues Authorities Act. Rangers appointed by the Director General, Communities NSW (Sport and Recreation) are empowered to enter the site to detect and act on any illegal activity.

6. Induction and Training

6.1 Construction Phase

Environmental inductions will be conducted by the Contractor's site manager and Contractor's Ecologist(s) to inform the contractors and any other personnel requiring access to the site of their obligations to protect native and threatened biota under relevant State and Federal legislation. The induction will explain the high biodiversity values of the site and enforce the requirement to comply with the protocols and procedures contained in this Ecological Management Plan.

During the induction staff will receive training on relevant management procedures and protocols contained in Appendix E. Any person needing to access the site during the construction phase must undergo the project induction before gaining entry.

6.1.1 Protection of native flora, fauna and habitats

The inductions will emphasize the requirement to protect native vegetation, fauna and habitats from disturbance as far as possible and the avoidance of works outside the clearly demarcated construction footprints.

Particular focus will be placed on clearly explaining the mitigation measures and detailed Management Procedures contained in the EMP to be implemented during the construction phase to minimise the potential for adverse impacts on the biodiversity values of the Plan area.

Site personnel and those involved in access track and fire trail upgrades or maintenance will receive specific training on the identification of threatened flora that favour disturbance and that may potentially establish along disturbed edges of access roads (Section 5.2.3).

6.1.2 Biosecurity protocol

Training will be provided to inform attendees of personal and vehicle disinfection procedures to be followed when entering and exiting the site. Construction personnel will be required to show competency in machinery inspection and cleaning. This training will be of particular importance in preventing the introduction and spread of pathogens and disease, such as Phytophthora and Amphibian Chytrid Fungus (Section 5.5.4).

Biosecurity log books will be provided and it will be explained that these will be periodically checked. The induction will also nominate the person responsible for their completion.

6.1.3 Weed and control within and adjoining the construction zone

Training will be provided in relation to personal and vehicle decontamination procedures to be followed when entering and exiting the site (i.e. Weed Stop course). Construction personnel will be required to show competency in machinery inspection and clean downs. WeedStop log books will also be required to be kept, and should also be inspected regularly by the contractor site manager.

6.1.4 Pest animal control

Training will be provided regarding requirements for:

- the appropriate and regular disposal of rubbish and food scarps to discourage pests; and
- requirements to report pest animals observed to the contractor site manager.

The induction will make clear that management of pest animals will be undertaken in conjunction with control programs for the surrounding conservation estate, and will not be the responsibility of site or construction personnel.

6.2 Operational Phase

Inductions will also be required for permanent staff and maintenance workers during the operational phase of the project to familiarise them with management procedures. During the induction staff will receive training on relevant management procedures and protocols contained in the OEMP.

7. Monitoring and Review

The following monitoring programs will be implemented to ensure that the development within SP1 and other site activities do not adversely impact on the remainder of the Plan area. The monitoring programs aim to detect impacts and identify appropriate remediation activities and to inform decisions on appropriate adaptive management activities.

7.1 Biodiversity Values

Annexure B of the Conservation Agreement (see Appendix B) contains dated aerial photographs/maps showing the location of the E2 environmental conservation area, the conservation values and photopoints. Photographs have been taken at these photo-points during the preparation of the Agreement. The aim of the photo-points is to provide baseline information and data for ongoing monitoring and adaptive management of the conservation area. Further photo-point photographs will be taken prior to and following the proposed development on site.

Photographs at the identified and future post development photo points will be taken at regular intervals in consultation with DECCW officers for the purposes of ongoing monitoring of conservation values in accordance with Item 1 y) of the Conservation Agreement. Photos and any observed changes in the conservation area will be documented in the Annual monitoring report for the Plan Area to be prepared by the Land Manager (Communities NSW) and submitted to DECCW. This will form the basis for decisions regarding ongoing management actions.

7.2 Weed Presence

The SP1 area of the site is essentially weed free. Regular monitoring during the construction phase of the development will aim to ensure that any small, newly-established weed populations can be easily removed by hand, or similar small-scale methods. Weekly site inspections of the construction area by the Site Manager and Contractor personnel should report any weed occurrence on the construction area or in adjoining vegetation for early removal and management.

The presence of weeds in the SP1 area is to be monitored annually by a qualified bush regenerator in accordance with item 1(a) of the Conservation Agreement. Baseline weed mapping undertaken in the development area and immediate surrounds during the pre-construction phase and photos at established photopoints following construction activities will be used to determine changes in weed levels and to identify required management activities. Photos are to be taken annually at established photopoints in the Plan area (see Section 7.1) to monitor changes in weed levels and to form the basis for decisions on ongoing management activities.

Weed management in the Plan area consistent with programs to be applied to the surrounding DECCW eastate may form a component of the agreed annual works program under the MOU between the PWG (Nattai area) and Communities NSW (Sport and Recreation). A report on the annual works and the targets met by the program will be submitted to Communities NSW at the end of each financial year.

7.3 Phytophthora

Phytophthora dieback will be monitored in accordance with the Phytophthora Monitoring Protocol outlined in this document (Section 5.5.5). The development and implementation of this protocol is a condition of approval according to the Determination of Major Project No 06_0232 (DoP 2010) for this project.

Once phytophthora infection is present in a community it is extremely hard to eradicate and hygiene measures to prevent the introduction of the pathogen are provided in Section 5.5.4.

7.4 Feral Animals

Monitoring of European Rabbit activity will be undertaken within the cleared firing ranges and surrounding areas through periodic searches of the sites, noting any signs of the presence of these species, including grazing, burrows and scats /pellets. Any observed increase in activity would trigger the development of a management plan to control these species, in conjunction with local National Parks Officers and the Rural Lands Protection Board.

Feral animal management will form a component of the agreed annual works program to be undertaken by the Parks and Wildlife Group, as outlined in the draft Memorandum of Understanding between the Group and Communities NSW. Any feral animal management or monitoring initiatives undertaken in surrounding lands managed by the Parks and Wildlife Group will also be undertaken in the Plan area. A report on the annual works and the targets met by the program will be submitted to Communities NSW at the end of each financial year.

Feral animal management in the Plan area consistent with programs to be applied to the surrounding DECCW estate may form a component of the agreed annual works program under the MOU between the PWG (Nattai area) and Communities NSW (Sport and Recreation). A report on the annual works and the targets met by the program will be submitted to Communities NSW at the end of each financial year.

7.5 Heavy Metal and Chemical Contamination

A long-term monitoring program will be implemented at the site to monitor possible metal accumulation and migration from the site in accordance with Section 5 of the Water Cycle Management Plan (GHD 2010b, c). The monitoring program will include:

- Soil Contamination Monitoring;
- Sediment Monitoring;
- Surface Water Contamination Monitoring;
- Inspections for evidence of shot loss and ricochet;
- Inspection of engineering controls (shot curtain, stop butts, shot fall zones and erosion control structures;
- Inspections of vegetation health and density; and
- Collection and analysis of fauna carcasses for lead or heavy metal contamination (where the opportunity arises).

Chemical storage, disposal and handling procedures will be monitored in conjunction with health and safety audits.

8. Reporting

8.1 Development Construction Phase

Reporting on the implementation of ecological management measures, incidents, non-conformance and counteractive actions to rectify non-conformance will be required throughout the entire construction phase and will be the responsibility of the Contractor's site manager.

The site manager and contractor workforce will perform daily inspections of work areas and construction activities to ensure compliance with the CEMP, including ecological management measures outlined in this EMP. The results of these surveys and all incidences will be recorded, including for example the accidental damage or removal of vegetation outside the construction footprint, injured/deceased animals, biosecurity breaches, weed infestations and feral animal detection. Recommendations for remedial actions will also be noted.

The contractor will be responsible for preparing and submitting weekly and monthly environmental field inspection reports to the Land Manager summarising the results of inspections and environmental performance in accordance with the requirements of the CEMP.

These reports will incorporate documentation compiled by the contractor's wildlife specialist with respect to fauna management during the vegetation clearing activities. Information to be collected includes observations of animals that are either injured, dead, required to be 'moved on' into adjacent bushland, or relocated under the supervision of the wildlife specialist (see Appendix E). The species name, location where it was first observed, location where it was released to (where applicable) and the management outcome (i.e. deceased, injured, moved on, relocated) will all be noted. Similar information will be collected during construction activities.

The field inspection reports will be included in Annual Environmental Reporting for the Plan area prepared by Communities NSW (Sport and Recreation) (see below).

8.2 Annual Reporting for Plan Area

Under the conservation agreement pursuant to the National Parks and Wildlife Act for the site (2010), the land manager of the site (Communities NSW) is required to complete an annual monitoring report for submission to DECCW. This report will provide the basis for decisions about ongoing management actions, and should include:

- A summary of ecological management measures implemented and results during the pre-construction and construction phases of the development within the Plan area;
- Photopoint photos for comparison of vegetation changes [refer to Conservation Agreement (2010)];
- Records of any threatened flora or fauna species encountered during operational activities of the project;
- Summary and results of control activities undertaken for weeds and feral animals (including those undertaken in conjunction with Bargo SCA programs);
- Results of environmental monitoring surveys, inspections and analyses:
  - Phytophthora monitoring
  - Soil Contamination Monitoring

  - Sediment Monitoring
  - Surface Water Contamination Monitoring
  - Inspections for evidence of shot loss and ricochet
  - Inspection of engineering controls
  - Collection and analysis of fauna carcasses for lead or heavy metal contamination (where the opportunity arises)
- Incident reporting and actions.

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Appendix A

Determination of Major Project No.06_0232

ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979

DETERMINATION OF MAJOR PROJECT NO. 06_0232

(FILE NO. S06/00600)

I, the Minister for Planning, having considered Section 75J(2) of Part 3A of the *Environmental Planning & Assessment Act 1979*, determine the major project referred to in the attached Director-General's Environmental Assessment Report, by **giving of approval** to the major project referred to in the attached Schedule 1 subject to the conditions of approval in Schedule 2 and the Statement of Commitments in Schedule 3.

This approval applies to the plans, drawings and documents cited by the Proponent in their Environmental Assessment, Preferred Project Report and Statement of Commitments, subject to the conditions of approval in Schedule 2.

The reasons for the imposition of conditions are:

(1) To ensure the site is appropriately managed for the proposed use;

(2) To adequately mitigate the environmental and construction impacts of the development;

(3) To reasonably protect the amenity of the local area; and

(4) To protect the public interest.

Tony Kelly MLC
Minister for Planning

Sydney 01 MAR 2010 2010

SCHEDULE 1

PART A — TABLE

Application made by:	NSW Sport and Recreation
Application made to:	Minister for Planning
Major Project Number:	06_0232
On land comprising:	Lot 100 DP 1088254
Local Government Area	Wingecarribee
For the carrying out of:	Southern Highlands Regional Shooting Complex
Capital Investment Value	$5.1 million
Type of development:	Project approval under Part 3A of the EP&A Act
Determination made on:	
Determination:	Project approval is granted subject to the conditions in the attached Schedule 2.
Date of commencement of approval:	This approval commences on the date of the Minister's approval.
Date approval is liable to lapse	5 years from the date of determination unless specified action has been taken in accordance with Section 75Y of the EP&A Act

PART B — DEFINITIONS

In this approval the following definitions apply:

Act means the *Environmental Planning and Assessment Act, 1979* (as amended).

BCA means the Building Code of Australia.

Council means Wingecarribee Shire Council.

Department means the NSW Department of Planning or its successors.

DECCW mean the NSW Department of Environment, Climate Change and Water, or its successors

Director means the Director of the Strategic Assessment Branch of the Department.

Director General means the Director General of the Department.

Environmental Assessment means the document titled NSW Sport and Recreation Southern Highlands Regional Shooting Complex Environmental Assessment (Volumes 1 & 2) prepared by GHD and dated February 2008.

Executive Director means the Executive Director of the Urban Renewal and Major Sites Division within the Department.

Major Project No. 06_0232 means the project described in Condition A1, Part A, Schedule 2 and the accompanying plans and documentation described in Condition A2, Part A, Schedule 2.

Minister means the Minister for Planning.

New Ranges means ranges approved for the site (other than the existing 800m range and ancillary facilities), as well as new ancillary facilities and infrastructure on the site to service those new ranges.

Project means development that is declared under Section 75B of the Act to be a project to which Part 3A of the Act applies.

Preferred Project Report means the document titled *NSW Sport and Recreation Southern Highlands Regional Shooting Complex Submissions Report* prepared by GHD dated July 2008.

Proponent means the person proposing the carry out of development comprising all or any part of the project, and includes persons certified by the Minister to be the proponent.

Regulations means the *Environmental Planning and Assessment Regulations, 2000* (as amended).

Statement of Commitments means the Statement of Commitments (as they apply to this project) made by the Proponent.

Site has the same meaning as the land identified in Part A of this schedule.

SCHEDULE 2

CONDITIONS OF APPROVAL

MAJOR PROJECT APPLICATION NO. MP 06_0232

PART A – ADMINISTRATIVE CONDITIONS

A1 *Development Description*

Project Approval is granted only to the carrying out of the following works for the purposes of the Southern Highlands Regional Shooting Complex:

- Retention of the existing rifle range (800m), clubhouse, amenities block and access roads.
- An additional rifle range (500m x 100m);
- A new pistol range (50m x 140m);
- A new combined range for rifle and pistol shooting (200m x 85m);
- A new shotgun range;
- An new indoor air range (21m x 17m x 6.5m); and
- New supporting facilities and infrastructure including:
  - Clubhouse and toilet facilities;
  - Access roads connecting Wattle Ridge Road to the clubhouse and shooting ranges;
  - Diesel generator, solar panels, water supply tanks and septic system;
  - Sealed parking areas for approximately 180 cars, and
  - Ponds for water quality control and fire fighting purposes.

A2 *Development in Accordance with Plans and Documentation*

The development shall be in accordance with the **NSW Sport and Recreation Southern Highlands Regional Shooting Complex Environmental Assessment** dated February 2008 prepared by GHD and all Appendices, except where varied by the Preferred Project Report **NSW Sport and Recreation Southern Highlands Regional Shooting Complex Submissions Report** prepared by GHD dated July 2008, including the revised Statement of Commitments and all Appendices.

A3 *Inconsistency between plans and documentation*

In the event of any inconsistency between conditions of this project approval and the plans and documentation referred to above, the conditions of this project approval prevail.

A4 *Offsets Agreement*

The lease of 323 hectares of land from the Department of Lands by the Illawarra Regional Shooting Association is to be relinquished, any shooting licenses be withdrawn, and the land to be transferred to the Dharawal National Park. Evidence from DECCW of the transfer of land is to be provided to the Department of Planning, prior to the first Occupation Certificate, or commencement of use of the new ranges on the site.

A5 *Consolidation of shooting clubs*

Once all shooting ranges and facilities are constructed on the site, the Illawarra Regional Shooting Association and the Phoenix Pistol Club are to relocate all its shooting activities to the subject site.

A6 *Use of the existing 800m range*

The existing 800m range is permitted to be used on Saturdays and Sundays between 10am and 5pm, as per Schedule 4 of this approval, until such time as the range is used for 4 days per week.

The existing 800m range may be used up to 4 days per week (including weekends) and prior to the satisfaction of the Part B, C and D conditions of this approval, subject to an Interim Operational Management Plan being submitted to, and approved by the Department of Planning.

The Interim Operational Management Plan is to include

(a) Operational days of the shooting complex, and maximum number of shooters each day at the 800m range.

(b) Measures to manage any military use at the 800m range.

(c) Attended noise monitoring to be undertaken on the first 3 occasions of use of the 800m range from the date of this approval, thereafter, quarterly in the first twelve months of operations (aligned with each season) and annually thereafter to confirm noise levels from firearms measured at residences comply with appropriate limits. The monitoring must include that of the known noisest firearms being used on the 800m range

(d) Compliance monitoring results for the shooting complex to be posted within 7 days on a website and submitted to the Department of Planning and to Council to allow for public access to this information.

(e) Bushfire sub-plan and emergency and evacuation procedure plan including days when no shooting is permitted.

(f) Methods to encourage the use of non-lead based ammunition.

(g) Management of range including clean up of spent cartridges.

(h) Details of the location of warning signage on the site boundary or for bushwalkers.

A7 Hours of Use – Outdoor Ranges

(a) All outdoor ranges shall not operate for more than 4 days in any week, Mondays to Sundays (ie. there shall be no shooting on any outdoor range for at least 3 days a week). The hours of use of the outdoor ranges on these 4 days shall be between 10am and 5pm each day. No shooting is permitted on any of the outdoor ranges after 5pm

(b) Shooting on public holidays is not permitted except for Special Events (refer to Condition A10).

A8 Hours of Use – Indoor Range

The indoor range is permitted to operate for 7 days per week between 9am and 5pm and 3 nights per week between 5pm and 10pm. Shooting on public holidays is not permitted except for Special Events (refer to Condition A10).

A9 Firearm Noise Limits

The noise from firearms or use of the site must not exceed 75dB(L) peak hold at the boundary to any existing private property with a residential dwelling, or where this is more than 30 metres from a dwelling, at the most affected location within 30 metres of the dwelling. This is to apply during prevailing weather conditions.

A10 Special Events

Up to 3 regional, state or national competitions, also known as Special Events, can be staged at the shooting complex each year. Special events may be held on public holidays. Written notice shall be provided to the Department at least 30 days prior to the start of each competition.

Variations to other conditions of this approval may be considered for these special events, subject to the approval of a management plan by the Director General of the Department of Planning. The management plan shall include details of the events schedule, number of competitors and any additional mitigation measures required to address noise, traffic or other amenity impacts.

A11 Independent Auditing and Reporting

(a) A report shall be prepared each year for the first 3 years of operation, and once every 3 years thereafter, by an independent auditor chosen by the Department of Planning to demonstrate compliance with this project approval and conditions. A copy of the report shall be posted on a website and submitted to the Department of Planning and to Council

(b) Copies of all other reports required by this project approval, including the results of all noise testing, shall be posted on a website and submitted to the Department of Planning and to Council.

(c) Upon 12 months of the operation of the shooting complex, the independent review referred to in Condition A10(a) above, shall be carried out by a suitably qualified person selected by the Department of Planning. The review shall address the shooting complex's compliance with all conditions of approval during its operation and make a recommendation to the Department as to the appropriate operating hours for the continued operation of the complex based on the management activities implemented and the compliance with the conditions.

A12 Lapsing of Approval

The project approval will lapse 5 years after the approval date in Part A of Schedule 1 of this project approval unless specified action has been taken in accordance with Section 75Y of the Act.

A13 Compliance with Relevant Legislation and Australian Standards

The proponent shall comply with all relevant Australian Standards and Codes (including Building Code of Australia) and obtain all necessary approvals required by State and Commonwealth legislation in undertaking the project.

PART B—PRIOR TO CONSTRUCTION OF NEW SHOOTING RANGES

B1 Construction and Environmental Management Plan (CEMP)

A Construction and Environmental Management Plan shall be submitted and approved by the Department of Planning prior to the commencement of any new works on site.

The CEMP is to include, but not be limited to, the following requirements:

(a) A vegetation clearing protocol including minimisation of vegetation removal and procedures for the identification of hollow bearing trees on the site and the relocation of any nesting and/or denning species

(b) Any fill to be used on the site to be clean.

(c) Construction hours to be consistent with Council's standard hours of construction.

(d) When remediation works are to be undertaken and the methods to be used.

(e) Management of construction noise and construction traffic noise to minimise (as far as practical) the impact in the vicinity of the subject site.

B2 Ecological Management Plan (EMP)

An Ecological Management Plan shall be submitted and approved by the Department of Planning prior to the commencement of any new works on the site.

The EMP is to include, but not be limited to the following requirements:

(a) Additional spring surveys and reporting for koalas, owls and microbats.

(b) All weed management activities must be undertaken by qualified bush regenerators using established bush regeneration techniques.

(c) The development and implementation of a program for the testing for the presence of *Phytophthora cinnamomi* and the implementation of hygiene measures to prevent the introduction and or spread of the pathogen and weeds during earthworks, survey, monitoring etc.

(d) A bushfire management plan should be development to ensure than an appropriate fire regime is applied at the site. Alternative methods to encourage the recruitment of priority species should be considered in areas where it is not possible to undertake large scale ecological burns.

(e) The development and implementation of a program that prevents the removal of bush rock from the site

(f) All hollow bearing trees, stags and Yellow Bellied Glider feed trees which are proposed to be retained on the site must be identified by a suitability qualified person and suitably marked and protected prior to any construction works commencing at the site

(g) Any landscaping at the site must be undertaken with native species endemic to the local area.

(h) That all other undertakings by the proponent in relation to ecology outlined in Section 7 – Mitigation Measures of the Supplementary Ecological Assessment (July 2008) should also be implemented.

(i) Any other environmental works detailed in the Submissions Report.

B3 Soil, Water and Contamination

(a) A Soil and Water Management Plan shall be prepared to meet the requirements outlined in Chapter 2 of the NSW Landcom's *Soils and Construction: Managing Urban Stormwater (2004)* manual – the "Blue Book". A copy of the Plan shall be submitted to the Department of Planning.

(b) The design capacity of the amended soil wastewater treatment and disposal system for the proposed shooting complex, including upgrade or transfer of the wastewater system at the existing Hill Top rifle Range, must be based on average and peak wastewater loads expected to be generated at the site.

(c) The amended soil mound must be located at least 100 metres form the Rocky Waterholes Creek or any other perennial or intermittent creek or watercourse, and at least 40 metres from any drainage depression and dam.

(d) A detailed water cycle management plan (WCMP) for the operation of the complex prepared by a person with knowledge and experience in the preparation of such plans which is to incorporate the elements of Appendix E of the Environmental Assessment . The WCMP shall also include:

(i) Sedimentation ponds for water quality management are to be designed and sized a proposed in the memorandum and associated sketch SK024 addressed to NSW Sport and Recreation from GHD (dated 7 May 2009) and otherwise are to be consistent with the requirements outlined in Volume 1 of the NSW Landcom's Soils and Construction: Management of Urban Stormwater (2004) manual, the "Blue Book".

(ii) The management or disposal of overflow and/or water from the proposed water quality control sedimentation ponds located along the ranges;

(iii) Management of the existing dam located on the proposed shooting complex site;

(iv) Identification and management of the risks associated with the use of water from the proposed water quality sedimentation ponds for fire fighting purposes; and

(v) Procedures and responsibilities for inspection, monitoring and maintenance of all water quality management structures (swales, diversion channels or earth berms, sedimentation ponds, rainwater tanks and drainage works).

(e) Plans and procedures for the remediation of any contaminated soils on the site.

(f) Emergency procedures for spill management of any contaminants including diesel.

(g) Ongoing monitoring plan, including monitoring of vegetation health, solids within and around all ranges, stop butt material, sedimentation ponds, groundwater monitoring, rainwater and the pre and post construction water quality of Rock Waterholes Creek for the key contaminants associated with the development. This plan must incorporate exception reporting as well as annual reporting of outcomes to the Sydney Catchment Authority, with the reporting identifying appropriate mechanisms to modify management practices and procedure where deleterious impacts on vegetation and water quality are demonstrated.

(h) Methods for achieving neutral or beneficial impact on water quality.

B4 Shotgun Range pond

The shotgun range pond is to be relocated to the north, outside the watercourse but can be located within a drainage depression. The sedimentation pond is to be designed so as to maximise the capture of stormwater runoff from the shotgun range and that the overflow outlets are located on the sides of the pond (ie. in the east and west to increase the flow path and avoid direct discharge into the watercourse).

B5 Earthworks for Sedimentation Ponds

All earthworks associated with the construction of sedimentation ponds are to be located at least 20 metres from any watercourse.

PART C—DURING CONSTRUCTION OF NEW SHOOTING RANGES

C1 Vegetation clearance

The vegetation clearing for the shooting ranges, internal roads and facilities shall be undertaken in a staged manner. Approval is granted for the clearing of vegetation associated with the 500m rifle range, 50m pistol range, clubhouse and ancillary works. Clearing for the 500m range is to be in accordance with Drawing No. 21-17859-C004 Rev A prepared by GHD.

Prior to any further vegetation clearing for any other ranges and/or facilities, written authorisation shall be obtained from the Director General once documentation is provided confirming the funding agreements and timing for completion of the other ranges and/or facilities, and that a management plan for the additional clearing has been approved by the Department of Planning

C2 Rural Fire Service Requirements

(a) At the commencement of buildings works and in perpetuity the property around the proposed clubhouse and indoor air pistol range shall be managed as follows:

(i) Northwest for a distance of 60 metres as an inner protection area and 25 metres and an outer protection area;

(ii) Northeast for a distance of 40 metres as an inner protection areas and 20 metres as an outer protection area;

(iii) Southwest for a distance of 50 metres as an inner protection area and 20 metres and an outer protection area;

(iv) Southeast for a distance of 40 metres as an inner protection area and 20 metres as an outer protection area;

(v) As outlined within *Planning for Bushfire Protection 2006* and the RFS document *Standards for asset protection zones*

(b) Water, electricity and gas are to comply with sections 4.1.3 and 4.2.7 of *Planning for Bush Fire Protection 2006* for the proposed clubhouse and indoor air pistol range.

(c) New construction shall comply with Australian Standard AS3959-1999 Construction of buildings in bush fire-prone areas Level 1 for the proposed clubhouse and air pistol range

(d) Arrangement for emergency evacuation are to comply with section 4.2.7 of Planning *for Bush Fire Protection 2006*.

PART D – PRIOR TO COMMENCEMENT OF USE OF NEW SHOOTING RANGES

D1 Works As Executed Plans

Prior to commencement of shooting activities, one (1) full set of works as executed plans, and other supporting documentation including further studies and revised plans required by this approval, shall be submitted to Council for information purposes only.

D2 Operational and Environmental Management Plan (OEMP)

An Operational and Environmental Management Plan should be prepared in consultation with DECCW and shall be prepared and submitted to the Department of Planning for approval prior to commencement of use of new ranges.

The OEMP is to include, but not be limited to the following requirements:

(a) Operational days of the shooting complex, and maximum number of shooters each day on each range, to reflect the usage figures in the Preferred Project Report.

(b) Attended noise monitoring to be undertaken on the first 3 occasions of use of each range/facility, thereafter, quarterly in the first twelve months of operations (aligned with each season) and annually thereafter to confirm noise levels from firearms measured at residences comply with appropriate limits. The monitoring must include that of the known noisiest firearms being used at the shooting complex.

(c) Compliance monitoring results for the shooting complex to be posted within 7 days on a website and submitted to the Department of Planning and to Council to allow for public access to this information.

(d) Bushfire sub-plan and emergency and evacuation procedure plan including days when no shooting is permitted.

(e) Design of ranges and management practices in accordance with the US EPA *Best Management Practices for Lead at Outdoor Shooting Ranges* as well as and regular clean up of spent bullets and target fragments.

(f) Erosion, sediment and stormwater controls.

(g) Methods to encourage the use of non-lead based ammunition.

(h) The proposed fencing and range danger areas approved by the NSW Firearms Registry.

(i) Ongoing environmental auditing and reporting.

(j) Trees along the embankment of the existing dam on the site, located adjacent to the proposed new clubhouse, are to be removed and that trees be kept clear from the embankments of all the sedimentation ponds, to minimise the possibility of trees damaging the dam.

D3 Road Safety Improvements

(a) The following road safety improvements shall be carried out at the proponent's expense in consultation with Council:
   (i) warning signage along Wilson Drive at the railway crossing to warn of narrow bridge and sharp bend.
   (ii) line marking along the length of West Street and the sealed section of Wattle Ridge Road; and
   (iii) other line marking and signage at relevant intersections to improve safety warnings and sight distances.

(b) The proponent shall prepare a maintenance schedule for the unsealed section of Wattle Ridge Road to the entrance to the site and enter into an agreement with Council in relation to the funding, responsibility and timing for carrying out of these maintenance works. Evidence of the agreement with Council shall be submitted to the Department of Planning for approval prior to the commencement of the use of the new shooting ranges.

   If no agreement has been reached within 3 months of the date of this approval, or 4 weeks after submission of the information to Council (whichever occurs first) the matter is to be decided by the Director General of the Department of Planning.

(c) A report of the traffic conditions in the vicinity of the site and at key intersections shall be prepared by a suitably qualified traffic consultant, 12 months from the commencement of the use of the new shooting complex. The report shall identify any changes in traffic conditions, and additional measures that may be required to address any additional traffic impacts on the local community. The report shall be submitted to the Director General for approval.

(d) The traffic report, identified in (c) above shall also address pedestrian safety around the local primary school. The report on traffic and pedestrian safety shall undertake baseline data collection prior to commencement of the use of the shooting complex, at key times of the day and week, for comparative purposes.

D4 Acoustic Shelters

Acoustic shelters shall be provided for the existing range (at the 800m firing point) and the new outdoor ranges. The shelters shall be constructed of an acoustically absorptive material and in accordance with the measures outlined in the detailed plans provided in the Preferred Project Report.

D5 Fencing and Warning Signs

All fencing and warning signage around the site, and closure of any bushwalking tracks within the range danger areas is to be in place prior to the commencement of the use.

PART E – OPERATION OF THE SHOOTING COMPLEX

E1 Storage of firearms

No firearms or ammunition is to be kept on site when the shooting complex is not in use, with the exception of special events referred to in Condition A10 of this Approval, in which case firearms and ammunition may be stored on site subject to approval by the NSW Police, under the provisions of the relevant legislation.

E2 Power Generator

The diesel power generator is to be located in a suitably designed and constructed in a sound proof building so that its use does not have any adverse effects on surrounding residents.

ADVISORY NOTES

AN1 Requirements of Public Authorities for Connection to Services

The proponent shall comply with the requirements of any public authorities (e.g. Energy Australia, Sydney Water, Telstra Australia, AGL, etc) in regard to the connection to, relocation and/or adjustment of the services affected by the construction of the proposed development. Any costs in the relocation, adjustment or support of services shall be the responsibility of the proponent

AN2 Roads Act, 1993

A separate application shall be made to Council for approval under Section 138 of the *Roads Act, 1993* to undertake any of the following:

(1) erect a structure or carry out a work in, on or over a public road, or

(2) dig up or disturb the surface of a public road, or

(3) remove or interfere with a structure, work or tree on a public road, or

(4) pump water into a public road from any land adjoining the road, or

(5) connect a road (whether public or private) to a classified road

AN3 Stormwater Drainage Works or Effluent Systems

Works that involve water supply, sewerage and stormwater drainage work or management of waste as defined by Section 68 of the Local Government Act, 1993 require separate approval by Council under Section 68 of that Act. Applications for these works must be submitted on Councils standard Section 68 application form accompanied by the required attachments and the prescribed fees.

AN4 Temporary Structures

An approval under Section 68 of the *Local Government Act 1993* must be obtained from the Council for the erection of the temporary structures. The application must be supported by a report detailing compliance with the provisions of the Building Code of Australia.

Structural certification from an appropriately qualified practicing structural engineer must be submitted to the Council with the application under Section 68 of the *Local Government Act 1993* to certify the structural adequacy of the design of the temporary structures.

AN5 Excavation – Historical Relics

Should any historical relics be unexpectedly discovered then all excavations or disturbance to the area is to stop immediately and the Heritage Council of NSW shall be informed in accordance with Section 146 of the *Heritage Act. 1977.*

AN6 Long Service Levy

Under Section 34 of the *Building and Construction Industry Long Service Payments Act 1986* any work costing $25,000 or more is subject to a Long Service Levy. The levy rate is 0.35% of the total cost of the work and shall be paid to either the Long Service Payments Corporation or Council. Under section 109F(1) of the Environmental Planning & Assessment Act, 1979 this payment must be made prior to commencement of building works.

AN7 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 provides that a person must not take an action which has, will have, or is likely to have a significant impact on a matter of national environmental significance (NES) matter: or Commonwealth land, without an approval from the Commonwealth Environment Minister.

This application has been assessed in accordance with the New South Wales *Environmental Planning and Assessment Act, 1979*. This assessment has not involved any assessment of the application of the Commonwealth legislation. It is the proponent's responsibility to consult Environment Australia to determine the need or otherwise for Commonwealth

approval and you should not construe this grant of approval as notification to you that the Commonwealth Act does not have application. The Commonwealth Act may have application and you should obtain advice about this matter. There are severe penalties for non-compliance with the Commonwealth legislation.

AN8 TransGrid Easement

Written consent from TransGrid will be required if any road works are required in the TransGrid easement area.

SCHEDULE 3

STATEMENT OF COMMITMENTS

(ATTACHED)

4. Statement of commitments

This section provides the final statement of commitments for the proposal. New or amended measures are indicated by blue text.

4.1 Management Measures

Table 4.1 Draft statement of commitments

Mitigation / management measures	Timing
General management plans	
Implementation of a construction environmental management plan as outlined in the environmental assessment	During construction
Implementation of an operational environment management plan as outlined in the environmental assessment	During operation
Ecology	
Hollow bearing trees and stags along roads and within the car park site will be retained.	Detailed design
To reduce the amount of vegetation clearance required, the routes for the access roads have been located so as to follow existing tracks wherever possible.	Detailed design
Partial clearance of vegetation within the shotgun range where the firing would occur over the line of canopy trees.	Detailed design
An offset package, involving: ▪ Addition of 552 hectares to the Yengo National Park ▪ Addition of 1,950 hectares to the Bargo State Conservation Area and ▪ Subject to the further development of the proposal, creation of the Dharawal State Conservation Area (323 hectares)	Completed / on receipt of approval for the proposal
Undertake vegetation clearance and tree-felling outside the critical Spring/Summer (November – May) nesting/breeding period for a wide range of fauna including a number of threatened fauna species.	During construction
Undertake targeted supplementary spring surveys.	Spring 2008
Undertake vegetation clearance and tree-felling outside breeding periods for the Yellow-bellied Glider, which breeds November to May	During construction
Indigenous heritage	
Where practicable, impact to the identified Aboriginal site HT 1 be avoided.	Detail design.

Mitigation / management measures	Timing
If impact to the Aboriginal site H i 1 cannot be avoided then the artefact be collected or relocated away from the area of impact.	Before construction.
If any Aboriginal artefacts are discovered during construction, all work cease in the area and the project manager be notified immediately. The project manager would be responsible for informing the OECC and the Local Aboriginal Land Council	During construction
Continued consultation occur with Northern Illawarra Aboriginal Collective and the Illawarra Local Aboriginal Land Council.	Before and during construction.
Traffic	
NSW Sport and Recreation commits to contribute to an appropriate level of funding to support regular maintenance needs for Wattle Ridge Road. In this respect the agency will liaise with the Wingecarribee Shire Council to determine an appropriate level of financial support for this purpose.	Before and during construction.
Bush fire risks	
The asset protection zones proposed for the clubhouse as described in Appendix D of the Environmental Assessment would be incorporated as part of the design	Detailed design
Level 1 construction standard under AS 3959-1999 would be used for the proposed clubhouse	Detailed design
Water supply would incorporate the following:	Detailed design
▪ A minimum of 10,000 litres dedicated water supply (concrete or underground tank) would be provided for protection of the clubhouse. ▪ 200 mm access hole (underground tanks are installed with a hardstand ground surface for truck access within 4 metres of the access hole ▪ A 65 mm Storz outlet with Gate or Ball valve located within the inner protection area and connected to the static water supply ▪ Metal pipework and fittings and ▪ Shielded pump (if electricity)	
The property access roads from Wattle Ridge Road to the buildings would comply with the 'Acceptable Solutions' for Special Fire Protection Purpose developments contained in PBP 2006 (NSW RFS 2006 p.35)	Detailed design.
Contamination	
Remedial on of the existing slopbuilt and immediate surrounds, in accordance with DECC requirements so that it meets health and ecological investigation levels suitable for recreational open spaces	During construction
A qualified site assessor will assess the existing slopbuilt and prepare a site audit. A Site Audit Statement will be prepared	During construction

Mitigation / management measures	Timing
by a qualified site auditor to assess the existing stopbutt and confirm the existing stopbutt has been remediated and is suitable for its intended use	
Water catchment, hydrology and water management	
Sediment control ponds would be established at the commencement of construction. A minimum of 6 ponds, with a combined storage volume of 3,620m3 would be provided and would be retained for operation of the proposal.	During detailed design, construction and operation
Stopbutts and target mounds would be designed to reduce erosion, including the construction of a 2:1 slope to improve stability, to promote low-velocity sheet flow, and to assist with vegetation establishment.	During detailed design
Stopbutts would be constructed from suitable clean site soils or imported clean fill and all rocks and other debris removed to minimise the potential for ricochet	During construction
The stopbutt would be designed to minimise contact between water and projectiles to reduce the rate of shot deterioration and metal leaching.	During detailed design
Undertake monitoring program as detailed in Appendix E of the Environmental Assessment.	During operation
Noise	
Noise Monitoring would be undertaken in different climatic conditions to confirm allowable operational usage in accordance with Chapter 164 the DECC's *Environmental Noise Control Manual*.	During operation.
The noise impacts, including traffic noise, of any proposal to increase site usage would be subject to detailed investigation once the new ranges have been built. This would involve noise measurements at the nearest sensitive receivers, of all firearms (recreational and military) used and fired in their respective ranges. Measurement results may trigger additional measures such as • Altering the acoustic design of the ranges, • Restriction of firearms used on the site, and • Restriction of the use of certain firearms to specific ranges Monitoring any new firearm with a potential to be louder than existing firearms used and proposed to be used on site to ensure it does not affect the allowable maximum site usage. Undertaking noise monitoring annually to confirm compliance with Chapter 164 of the DECC's *Environmental Noise Control Manual*.	During operation
Social	

Mitigation / management measures	Timing
NSW Sport and Recreation and members of the environmental assessment team will be available to respond to questions received.	During Public Exhibition
Miscellaneous	
A Conservation Agreement with DECC for approximately 900 hectares of land within the site.	Before construction
A new lease would be signed with the Southern Highlands Regional Shooting Complex Inc for management of approximately 135 hectares of land.	Before operation

SCHEDULE 4

1. The licensee of the property must implement a Facility Management Strategy which includes the centralised booking of the use of the facility and for each day that the Range is being used, the recording of
   - The number of shooters using the facility;
   - The start and finish times;
   - The number of vehicles on the property; and
   - The number of visitors on the property.

2. The strategy must also provide for:
   - The security of the facility so that only authorised usage occurs;
   - Enforcing the approved limits on the number of shooters; and
   - Complying with the approved hours of operation, namely 10.00am to 5.00pm.

3. The strategy must be made available to Council upon request.

4. The licensee must provide Council with an Operational Environmental Management Plan (OEMP) to address any existing and potential impacts upon water quality arising from the use of the facility

   Note. The OEMP should be modelled on the OEMP suggested by the Sydney Catchment Authority for the regional complex and must be implemented immediately upon approval by Council.

5. The number of shooters on the property must not exceed the following on any occasion

Day	*Max No. of Shooters*	*Day*	*Max No. of Shooters*
1st Saturdays	*12*	*1st Sundays*	*10*
2nd Saturdays	*12*	*2nd Sundays*	*10*
3rd Saturdays	*12*	*3rd Sundays*	*8*
4th Saturdays	*12*	*4th Sundays*	*10*
5th Saturdays	*Nil*	*5th Sundays*	*10*
*Annual competitions**	*20*		

* *Note: Maximum of 4 annual competitions per year and must be held on a weekend.*

6. The licensee shall provide a report on each anniversary of this approval providing such information as required by Council to substantiate compliance with the above conditions of approval.

7. Appropriate warning signs or barriers advising of the danger of trespass shall be erected in accordance with the requirements of the licensing authorities.

8. A radio telephone or other similar means of communication for use in case of emergency shall be kept on site during use of the range.

Appendix B

Conservation Agreement

CONSERVATION AGREEMENT

BETWEEN

THE MINISTER ADMINISTERING THE NEW SOUTH WALES NATIONAL PARKS AND WILDLIFE ACT (1974)

AND

The Minister administering the Sporting Venues Authorities Act (2008)

Dated: August 2008

_____

Minister administering the
Sporting Venues Authorities Act, 2008.

_____

Minister

CONSERVATION AGREEMENT UNDER PART 4 DIVISION 12 OF THE NATIONAL PARKS AND WILDLIFE ACT, 1974.

THIS AGREEMENT made the day of , Two thousand and , between **THE MINISTER** for the time being administering the *National Parks and Wildlife Act, 1974* ("the Minister" which expressions shall where the context admits, be deemed to include successors in office) of the one part and the Minister administering the *Sporting Venues Authorities Act, 2008* ("the Owner") of Lot 100, Wattle Ridge Rd, Hilltop of the other part.

WHEREAS:

A The Owner is the registered proprietor of that parcel of land being Lot 100, Deposited Plan 1088254, Parish of Cumbertine, County of Camden ("**the Land**"). The Land is shown by hatching on Diagram A annexed to this Agreement and is the conservation area ("**the conservation area**"), covering 1,036 hectares.

B The conservation area contains a high level of floristic diversity comprising largely undisturbed sandstone shrub woodland, heath woodland and mallee vegetation communities. Minor variations in canopy and mid-storey dominants occur with typical canopy species including Scribbly Gum (*Eucalyptus sclerophylla*), Grey Gum (*Eucalyptus punctata*), Blue-leaved Stringybark (*Eucalyptus agglomerata*), Sydney Peppermint (*Eucalyptus piperita*), White Stringybark (*Eucalyptus globoidea),* Red Bloodwood (*Corymbia gummifera*) and Mountain Ash (*Eucalyptus sieberi*). Sheltered Sandstone Forest occurs on sandstone slopes that descend into steeply dissected gullies and creeklines throughout the conservation area. Common canopy species comprise *Corymbia gummifera, Eucalyptus agglomerata, E. piperita* and *E. punctata.* The gullies and creeklines have moist forest vegetation communities present.

C The Owner and the Minister recognise that the conservation area contains regionally rare and significant plant species, such as *Eucalyptus apiculata*, and contains potential habitat for other rare plant species listed in Table 1, Annexure B. The conservation area is an integral component of a significant wildlife corridor and has important catchment and water quality values.

D The conservation area contains known habitat for the Barking Owl (*Ninox connivens*), Koala (*Phascolarctos cinereus*) and Yellow-bellied Glider (*Petaurus australis*) which are listed as Vulnerable species on Schedule 2 of the *NSW Threatened Species Conservation Act, 1995.*

E The conservation area provides potential habitat for a diverse range of additional threatened fauna species, including**:**

- Twenty-five (25) threatened fauna species listed under the *NSW Threatened Species Conservation Act,1995* including three (3) endangered and twenty-two (22) vulnerable species; and
- seven (7) threatened fauna species listed under the *Environment Protection and Biodiversity Conservation Act,1999* including three (3) endangered and four (4) vulnerable species.

These species are listed in detail in Table 2, Annexure B.

F The Owner and the Minister recognise that the conservation area is regionally significant due to existing linkages with other bushland properties and Crown land creating a significant wildlife corridor. The property was previously part of and adjoins the Bargo State Conservation Area.

G The Owner and the Minister recognise that the conservation area is of cultural significance. The area was used and continues to be used by the Gundungurra and Dharawal Aboriginal people. The property contains artifact scatters and may contain other sites of cultural significance.

H The Owner and the Minister recognise that the land, which was previously part of the Bargo State

Recreation Area is vested with the Owner for the development of the Southern Highlands Regional Shooting Complex planned for development in Zones 2 and 3 shown on Map 1 in Annexure B.

I Accordingly, the parties hereby enter into the following Conservation Agreement under Section 69B Part 4 Division 12 of the *National Parks and Wildlife Act, 1974.*

J The Owner and the Minister agree to take steps to protect and manage the conservation values of the conservation area as set out in Annexures B and C.

NOW THIS AGREEMENT WITNESSES:

1. INTERPRETATION

1.1 In this Agreement unless the contrary intention appears:-

"**Aboriginal Object**" has the same meaning as in Section 5 of the Act;

"**Aboriginal Place**" has the same meaning as in Section 5 of the Act;

"the **Act**" means the *National Parks and Wildlife Act, 1974* and any regulations from time to time in force thereunder;

"**conservation area**" means that part of the Land shown by hatching on the diagram annexed to this Agreement as Annexure A;

"**conservation values**" includes, without limitation, any native fauna and their habitats, native plants and their habitats, cultural heritage, and geo-heritage.

"**controlled burning**" means the controlled application of fire under specified environmental and weather conditions to a predetermined area and at the time, intensity and rate of spread required to attain planned resource management objectives;

"**critical habitat**" has the same meaning as in Section 4 of the *Threatened Species Conservation Act, 1995;*

"**cultural heritage**" refers to the historic, archaeological, social, cultural and contemporary values of the physical evidence and traditions of peoples, including Aboriginal peoples.

"**damage**" means incurring injury that impairs the values or usefulness of the conservation area

"**DECC**" means the NSW Department of Environment and Climate Change;

"**development**" has the same meaning as provided for in Section 69A of the Act;

"**Director-General**" has the same meaning as Section 5 of the Act;

"**fauna**" has the same meaning as in Section 5 of the Act;

"**geo-heritage**" means geological deposits and landforms that are considered to have conservation values.

"**indigenous fauna**" means all native fauna belonging naturally to the conservation area;

"**indigenous plants**" means all native plants belonging naturally to the conservation area;

"**Land**" means that parcel of land described in Recital A;

"**Management Scheme for the conservation area**" means management scheme prepared for the conservation area in consultation with the owner, annexed to this Agreement as Annexure C;

"**Minister**" means the Minister for the time being administering the Act and where not repugnant to the context includes the servants and agents of the Minister;

"**native fauna**" has the same meaning as "protected fauna" in Section 5 of the Act;

"**native plant**" has the same meaning as in Section 5 of the Act;

"**Owner**" has the meaning as in s69A of the Act and includes any successor in title to the owner within the meaning of s 69E of the Act,

"**pesticide**" has the same meaning as in Section 5 of the *Pesticides Act,* 1999 which includes herbicides, insecticides, fungicides, baits and rodenticides;

"**reasonable**" in relation to carrying out an activity, means using the best methods available and carrying out the activity in such a way as to have minimal impact on the conservation values of the conservation area;

"**threatened species, populations and ecological communities**" and "**threatened species, population or ecological community**" have the same meaning as in the *Threatened Species Conservation Act, 1995;* and in the *Environmental Protection and Biodiversity and Conservation Act, 1999.*

1.2 Words importing the singular number shall include the plural and masculine gender the feminine or neuter and vice versa.

1.3 Any reference to a person shall be deemed to include a corporate body and vice versa.

1.4 Any covenant or agreement on the part of two or more persons shall be deemed to bind them jointly and severally.

2 USE OF THE CONSERVATION AREA

The Owner covenants with the Minister as follows:-

General responsibilities

2.1 Except as otherwise permitted by this Agreement, the Owner must not intentionally carry out any act or omit to carry out any act, or cause or permit any act to be carried out or any act not to be carried out which act or omission may harm any native fauna, native plants, their habitats, cultural heritage, geo-heritage or other conservation values in the conservation area.

Development

2.2 Except as permitted in this Agreement, the Owner shall not construct any new road, access track, building or internal fencing or any development that could adversely affect the conservation values of the conservation area.

2.3 The Owner shall be permitted to:

2.3.1 Maintain existing tracks only if required by essential services eg. Integral Energy, Rural Fire Services, DECC.

2.3.2 Undertake development and use consistent with any future development consent for Zones 2 and 3. (refer Map 1, Annexure B.)

2.3.3 Erect signage for management and safety purposes in consultation with DECC.

Subdivision

2.4 The Owner must not subdivide or permit the subdivision of Zone 1 (refer Map 1, Annexure B) of the conservation area.

Threatened species, ecological communities, populations and their habitats and critical habitat

2.5 Consistent with the *Threatened Species Conservation Act, 1995*, and the *Environmental Protection and Biodiversity Conservation Act, 1999*, where threatened species, populations and ecological communities occur in the conservation area, the Owner must manage the conservation area:

2.5.1 to protect and promote the recovery of threatened species, populations and ecological communities, and

2.5.2 to protect the critical habitat of those threatened species, populations and ecological communities that are endangered, and

2.5.3 to eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities, and

2.5.4 to ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed.

Fire

2.6 The Owner must not light a fire, or cause a fire to be lit on the conservation area, unless it complies with the *Rural Fires Act, 1997*, and:

2.6.1 the lighting of the fire is for the purposes of controlled burning and is carried out in accordance with any fire guidelines for controlled burning as provided for in Annexure C: Management Scheme for the conservation area; or

2.6.2 the lighting of the fire is a necessary component of bush fire hazard reduction work carried out in accordance with a notice served on the Owner under the *Rural Fires Act, 1997* or other applicable legislation; or

2.6.3 life or property is in immediate threat by bush fire and the lighting of the fire is reasonably necessary to protect life or property; or

2.6.4 the fire is a camp fire, subject to compliance with the *Rural Fires Act, 1997*, or

2.6.5 the Director-General gives prior written consent to the lighting of the fire.

Cultural Heritage

2.7 In accordance with Part 6 of the *National Parks and Wildlife Act, 1974*, the Owner must preserve and protect Aboriginal places and Aboriginal objects on the conservation area.

2.8 In accordance with Part 6 of the National Parks and Wildlife Act 1974, the Owner must obtain appropriate permits and consents if there is any potential to impact on Aboriginal objects.

Control of non-indigenous plants and fauna

2.9 Except as permitted in this Agreement the Owner:

2.9.1 must use his or her best endeavours to control, and where possible remove, all non-indigenous plants and non-indigenous fauna from all zones of the conservation area identified to have significant detrimental impacts on the conservation area; and

2.9.2 must take such reasonable measures in relation to the control of non-indigenous plants and non-indigenous fauna as specified in the Management Scheme (Annexure C).

3. MANAGEMENT OF THE LAND

3.1 The Owner must manage the conservation area in accordance with this Agreement.

3.2 The Owner must inform the Director-General as soon as practicable after becoming aware of the deterioration of any of the natural values or cultural values of the conservation area, or of any threat to these values.

3.3 This Agreement includes Annexure B describing and mapping the conservation values of the conservation area. An aerial photograph shows the location of the conservation area, the conservation values and photo-points. Photographs have been taken at the photo-points, during preparation of the Conservation Agreement. This provides baseline information and data for ongoing compliance monitoring and adaptive management of the conservation area.

3.4 This Agreement includes Annexure C, setting out the Management Scheme for the conservation area including the management of conservation values and other matters referred to in Annexure B.

3.5 Detailed management guidelines and actions for the conservation of the conservation area, may be prepared, subject to the endorsement of the Owner and the Director-General, and the terms of this Agreement.

4. USE OF THE LAND BY SERVANTS, AGENTS, LESSEES OR LICENSEES

The Owner must incorporate the terms of this Agreement in any lease or licence issued over the conservation area, and at all times ensure that any servant, contractor, consultant, agent, lessee, licensee occupying the conservation area shall be aware of the relevant provisions of this Agreement.

5. CHANGE OF OWNERSHIP

The Owner must notify the Director-General in writing of any change of Ownership or control of the conservation area within 28 days after the change of ownership and control. The notice must include the name and address of the new owner.

6. RIGHT TO INSPECT

The Minister, the Director-General and their servants and agents may at any time upon first giving reasonable notice to the Owner, the Owner's agent, lessee or licensee, enter upon the conservation area to ensure compliance with this Agreement.

7. OBLIGATIONS OF THE MINISTER

The Minister covenants with the Owner as follows: -

7.1 The Owner will bear the costs of, and incidental to, the preparation of this Agreement including payment of the Owner's reasonable legal costs connected with the execution of the Agreement and any necessary stamp duty and registration fees.

7.2 The Minister agrees to notify the Registrar General when this Conservation Agreement has been entered into, varied or terminated so that the Registrar General can carry out his or her responsibilities pursuant to section 69F of the Act

7.3 The Minister will arrange for the provision of technical advice and any other assistance to the Owner as the Minister deems necessary to assist with the implementation of this Agreement.

7.4 The Minister agrees to the extent of his or her statutory responsibilities that the signing of this Agreement shall not render the Owners ineligible for any compensation and assistance which

may, under future legislation, become available to landowners who enter into a Conservation Agreement pursuant to the Act or any other Act.

8. NON-COMPLIANCE

In the event that the Owner fails to comply with this Conservation Agreement, including, without limitation, damaging or causing damage to the conservation area, DECC may issue a written notice to the Owner requiring the owner to remedy the non-compliance or damage within a specified time period. This clause does not affect any rights of the parties under section 69G of the Act.

9. DISPUTE RESOLUTION

If a party to the Conservation Agreement is dissatisfied with the conduct of the other party under this Conservation Agreement, that party must notify the other. If the dispute cannot be resolved by discussions between the parties it shall be referred to the Premier in accordance with s.69J of the Act.

10. COMMENCEMENT

This Agreement shall have effect from the day of execution.

IN WITNESS WHEREOF the parties hereto have executed this Agreement the day and year first above written.

SIGNED by the Minister administering the *National Parks and Wildlife Act, 1974* for the purpose of rendering liable the Government of the State of New South Wales (but not so as to incur any personal liability) hereunder in the presence of:)

Minister:

Date

Witness

Witness Name and address

Date

SIGNED by the **OWNER**
Minister administering the *Sporting Venues Authorities Act, 2008*

Date

in the presence of

Witness signature

Witness Name and address

Date

Date

in the presence of

Witness signature

Witness Name and address

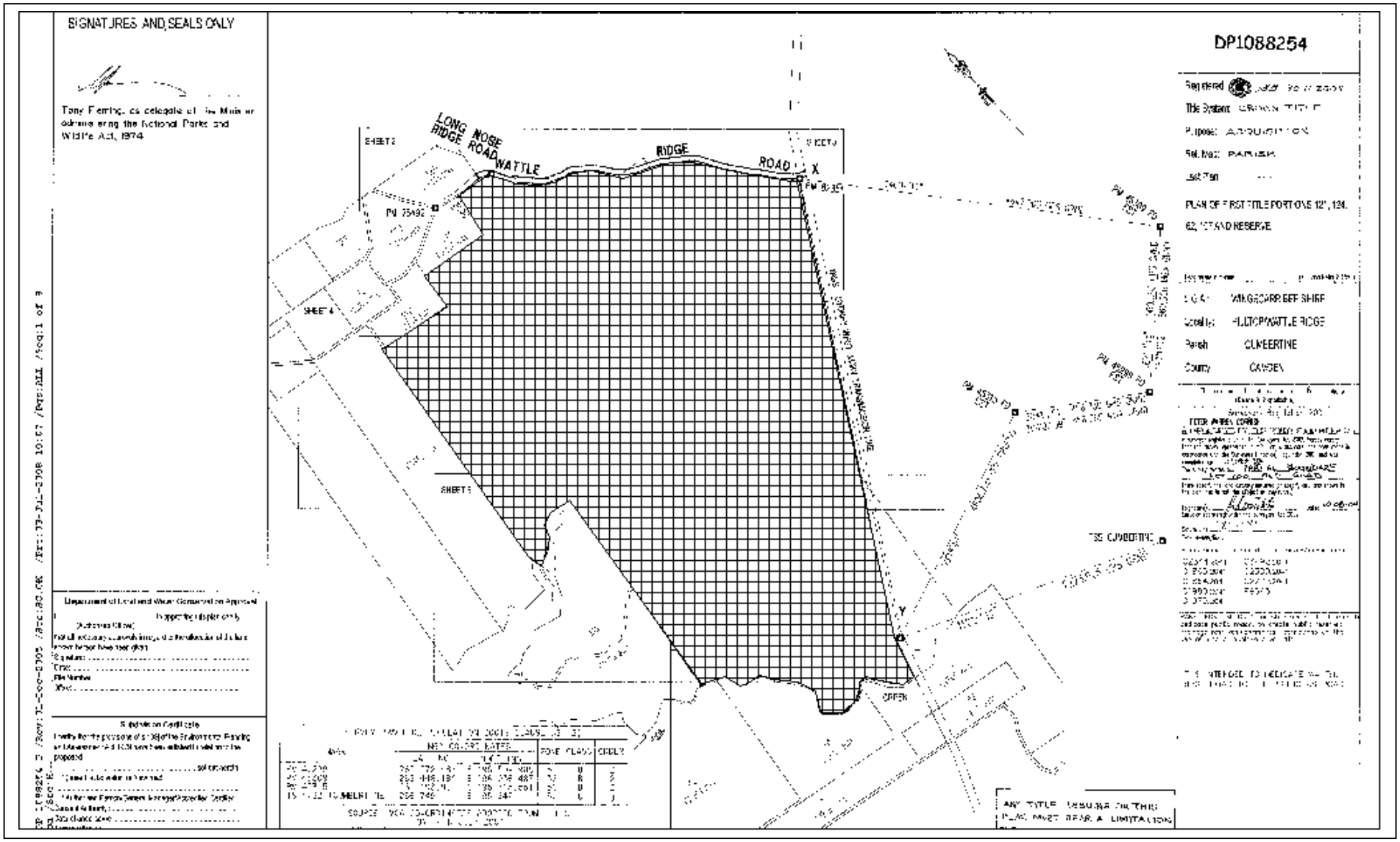
Date

Name and address of Owners representative for service of notices:

John C Shipway
Manager
Strategic Projects
Properties and Venues
NSW Sport and Recreation
6 Figtree Drive
Sydney Olympic Park
NSW 2127

Conservation Agreement **"Hilltop Conservation Area"**

ANNEXURE A DIAGRAM A.



Minister administering the
Sporting Venues Authorities Act, 2008.

Minister

ANNEXURE B
CONSERVATION VALUES

1. CONSERVATION VALUES

The Owner and the Minister recognise that the conservation area contains the following conservation values. Conservation values are to be managed in accordance with Annexure C: Management Scheme for the conservation area.

A The conservation area contains a high level of floristic diversity comprising largely undisturbed sandstone shrub woodland, heath woodland and mallee vegetation communities. Minor variations in canopy and mid-storey dominants occur with typical canopy species including Scribbly Gum (*Eucalyptus sclerophylla*), Grey Gum (*Eucalyptus punctata*), Blue-leaved Stringybark (*Eucalyptus agglomerata*), Sydney Peppermint (*Eucalyptus piperita*), White Stringybark (*Eucalyptus globoidea)*, Red Bloodwood (*Corymbia gummifera*) and Mountain Ash (*Eucalyptus sieberi*). Sheltered Sandstone Forest occurs on sandstone slopes that descend into steeply dissected gullies and creeklines throughout the conservation area. Common canopy species comprise *Corymbia gummifera*, *Eucalyptus agglomerata*, *E. piperita* and *E. punctata.* The gullies and creeklines have moist forest vegetation communities present.

B The conservation area contains regionally rare and significant plant species, such as *Eucalyptus apiculata*, and contains potential habitat for other rare plant species listed below in Table 1. The conservation area is an integral component of a large wildlife corridor and has important catchment and water quality values.

Table 1. Flora species that have the potential to occur on site.

Species	TSC Act	EPBC Act	Recorded On Site	Possible Occurrence
TSC Act = *Threatened Species Conservation Act, 1995*; EPBC Act = *Environment Protection and Biodiversity Conservation Act, 1999* V = vulnerable species E= endangered species				
Bynoe's Wattle (*Acacia bynoeana*)	E	V	N	Y
Needle Geebung (*Persoonia acerosa*)	V	V	N	Y
Bargo Geebung (*Persoonia bargoensis*)	E	V	N	Y
Hairy Geebung (*Persoonia hirsuta*)	E	E	N	Y
Mittagong Geebung (*Persoonia glaucescens)*	E	V	N	Y
Leafless Tongue Orchid (*Cryptostylis hunteriana)*	V	V	N	Y

C The conservation area contains known habitat for the Barking Owl (*Ninox connivens*), Koala (*Phascolarctos cinereus*) and Yellow-bellied Glider (*Petaurus australis*) which are listed as Vulnerable species on Schedule 2 of the *NSW Threatened Species Conservation Act, 1995* (TSC Act).

D The conservation area provides potential habitat for a diverse range of additional threatened fauna species, including**:**

- Twenty-five (25) threatened fauna species listed under the *NSW Threatened Species Conservation Act,1995* including three (3) endangered and twenty-two (22) vulnerable species; and

- seven (7) threatened fauna species listed under the *Environment Protection and Biodiversity Conservation Act,1999* including three (3) endangered and four (4) vulnerable species.

These species are listed below in Table 2.

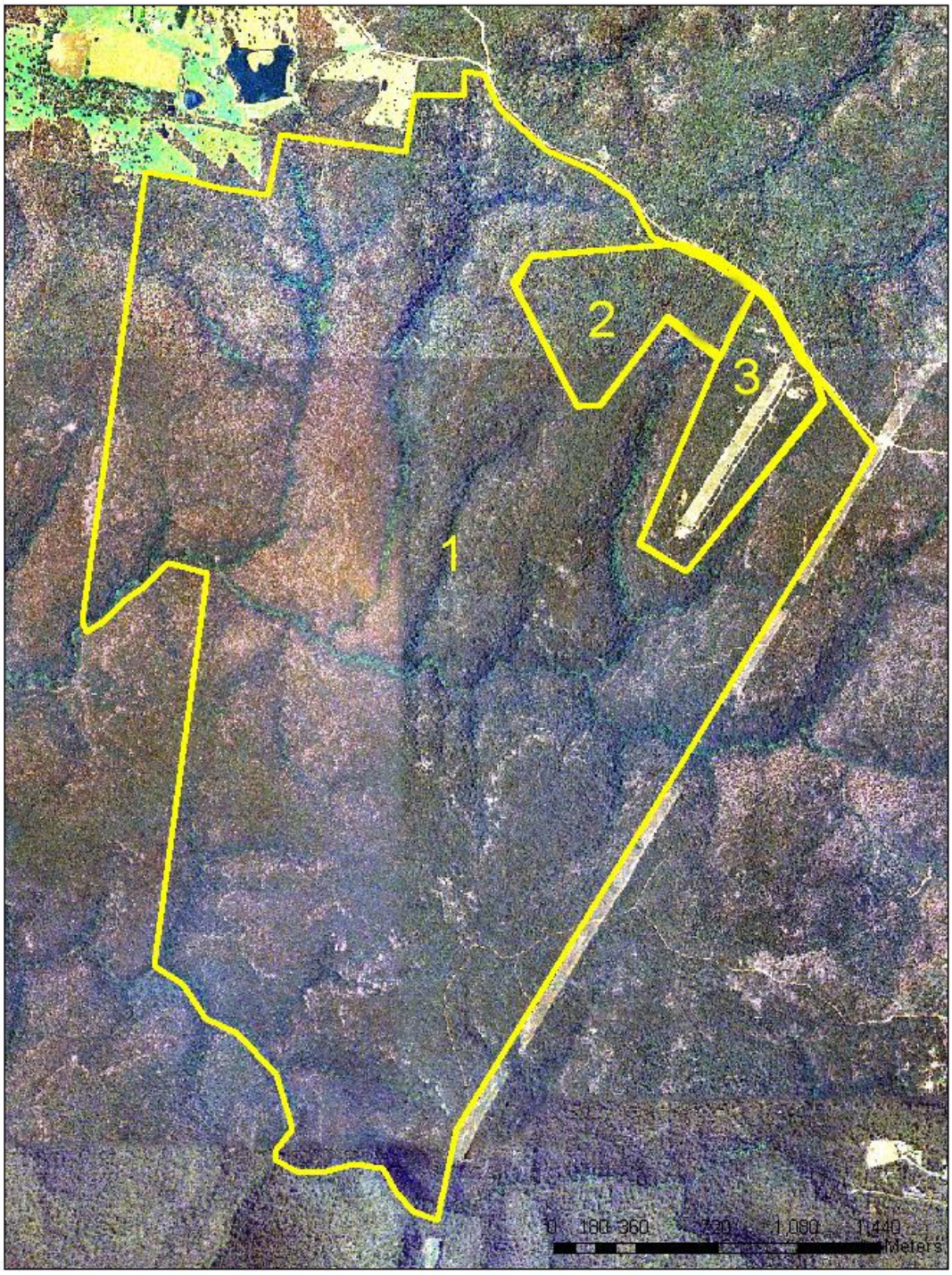
Table 2: lists the threatened fauna species which have the potential to occur on site.

Species	TSC Act	EPBC Act	Recorded On Site	Possible Occurrence
TSC Act = *Threatened Species Conservation Act, 1995*; EPBC Act = *Environment Protection and Biodiversity Conservation Act,1999* V = vulnerable species E= endangered species				
Giant Burrowing Frog (*Heleioporus australiacus*)	V	V	N	Y
Red-crowned Toadlet (*Pseudophryne australis*)	V	-	N	Y
Broad-headed Snake (*Hoplocephalus bungaroides*)	E	V	N	Y
Rosenberg's Goanna (*Varanus rosenbergi*)	V	-	N	Y
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	V	-	N	Y
Glossy Black Cockatoo (*Calyptorhynchus lathami*)	V	-	N	Y
Brown Treecreeper (*Climacteris picumnus victoriae*)	V	-	N	Y
Swift Parrot (*Lathamus discolor*)	E	E	N	Y
Powerful Owl (*Ninox strenua*)	V	-	N	Y
Barking Owl (*Ninox connivens*)	V	-	Y	Y
Sooty Owl (*Tyto tenebricosa*)	V	-	N	Y
Masked Owl (*Tyto novaehollandiae*)	V	-	N	Y
Spotted-tailed Quoll (*Dasyurus maculatus*)	V	E	N	Y
Southern Brown Bandicoot (*Isoodon obesulus*)	E	E	N	Y

E The conservation area is regionally significant due to existing linkages with other bushland properties and crown land creating a significant wildlife corridor. The property was previously part of and adjoins the Bargo State Conservation Area.

F The conservation area is of cultural significance. The area was used and continues to be used by the Gundungurra and Dharawal Aboriginal people. The property contains artifact scatters and may contain other sites of cultural significance.

AERIAL PHOTOGRAPH AND OTHER MAPPING

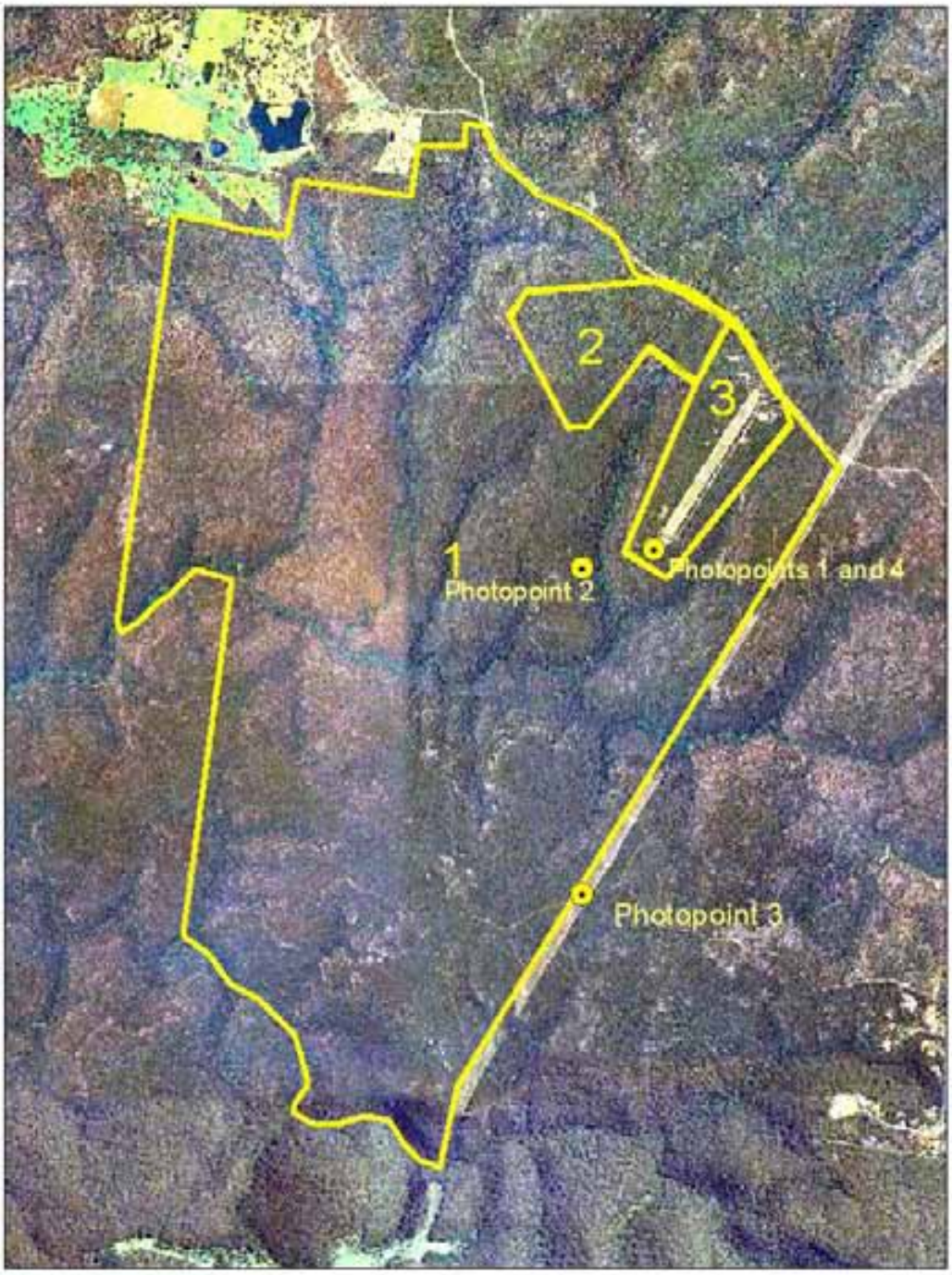


LEGEND
Zone 1 - Bushland
Zone 2 - Proposed future development area
Zone 3 - Existing development area

Department of Environment & Climate Change NSW

N

Map 1. Hilltop Conservation Area - Zones



Map 2. Hilltop Conservation Area - Photopoint Locations

3. PHOTO-POINT PHOTOGRAPHS AND OTHER PHOTOGRAPHS

Photopoint 1 (above)

View looking south-west over conservation area towards Mt Jellore.
(date taken: 30/5/2008)

(GR: 265500 6199200) (AGD 66)

Photopoint 2 (left)

Intact woodland on site.
(date taken: 30/5/2008)

(GR: 265400 6199000) (AGD 66)

Photopoint 3 (above)

Looking north west towards conservation area from powerline track. (date taken: 30/5/2008)

GR: 265245 6197524 (AGD 66)

Photopoint 4 (left)

Looking north-east along existing rifle range. (date taken: 30/5/2008)

(GR: 265500 6199200) (AGD 66)

ANNEXURE C

MANAGEMENT SCHEME FOR THE CONSERVATION AREA

The conservation values identified in Annexure B are to be managed in accordance with the principles and activities outlined below and consistent with the Nattai Reserves Plan of Management (2001) and other plans including the Conservation and Environmental Management Plan (NSW Sport and Recreation, 2008).

Three zones have been delineated within the conservation area, they are: Zone 1 – bushland; Zone 2 – area proposed for possible future development and Zone 3 – the existing developed area.

ITEM 1:
The following activities may be undertaken on, or in respect of, the conservation area in the manner specified as follows:

Weed control

a) Carrying out weed control using the appropriate control methods
   - Use glyphosate based herbicide by direct application to cut surfaces (cut and paint or scrape and paint methods)
   - Remove weeds by hand ensuring that all plant parts which can reproduce are removed and that soils do not become prone to erosion.
   - Other weed control methods may be undertaken with prior written permission of the Director-General.
   - Ensure control programs are commenced when timing and extent of weed removal will minimise adverse effects on wildlife (weeds may provide protection or habitat for native fauna).
   - A professional bush regenerator to undertake yearly inspections to check for weed invasion and treat any outbreaks.

   .

Feral animals

b) Monitoring impacts to the conservation area by feral animals and undertaking of on-going control programs for feral animals if appropriate.
   - Methods for control can include shooting, trapping and use of poisonous baits with advice from local Department of Environment and Climate Change officers and the Rural Lands Protection Board.
   - Participate in community feral animal control programs, and encourage neighbours to implement pest animal control programs.

Domestic animals and livestock

c) No domestic animals or livestock are permitted within the conservation area.

d) No horseriding permitted within the conservation area.

Fire

e) Suppression of all wildfires occurring in the conservation area as quickly as possible with the aim of keeping fires to a small area.

f) Undertaking fire hazard reduction (if recommended by RFS or DECC) to protect the natural assets of the conservation area, in appropriate locations, with any required approvals and/or permits using:
   - raking and hand clearing
   - pile burning
   - fuel reduction burns.

g) Using fire hazard reduction burns and controlled burning can occur within the conservation area, excluding riparian or wet gully vegetation which should not be subject to any controlled burns.
h) Hazard reduction burns and controlled burning will take into account the following recommendations (Table 3).

Table 3: Vegetation type/community and recommended fire/burning frequency

Vegetation Type/Community	Fire/Burning Frequency (years)
Sandstone Shrub Woodland	10-50
Heath Woodland	10-30
Mallee Woodland	10-50
Gully Vegetation	No prescribed burns
Riparian Vegetation	No prescribed burns

Vehicle Access

i) Vehicle access to Zone 3 permitted on existing formed access roads within designated operating hours.
j) Vehicle access to formed trails within Zones 1 and 2 for management purposes as approved by DECC, fire fighting or any emergency requirements.

Use of timber

k) No harvesting of fallen timber, except for hazard reduction purposes within defined asset protection zones, permitted within the conservation area.

Threatened species

l) Within zones 2 and 3, retain hollow bearing trees and stag trees along roads and tracks and within car park areas, where those trees do not pose a hazard to people or property.
m) Implementing any measures included in relevant recovery plans for any threatened species or communities which or may be found in the conservation area, including the recovery plan for Yellow-bellied Glider.
n) Implementing other specific management advice from DECC for any threatened species or communities which are or may be found in the conservation area.

Restoration of indigenous vegetation

o) Restoration of native vegetation using natural regeneration, including brush mulching as the preferred method.
p) Revegetation to establish indigenous plants, using species produced from material sourced locally and without fertilisers,
   - where the ability to regenerate naturally within a reasonable time frame has been lost, or
   - to prevent soil erosion;

Thinning of indigenous vegetation

q) Thinning of regenerating indigenous species which are altering the structure of the vegetation and/or reducing conservation values. Thinning should be planned in consultation with DECC.

Seed collection

r) Collection of seed in keeping with *Guidelines for Collection of Seed, and other Plant Propagation material* (available from DECC), and the following limitations and permissions:
   - Collect seed in the conservation area only should seed of particular species be not available elsewhere.
   - Licences are required for collection of material of protected plants listed under Section 131 (Schedule 13) of the *National Parks and Wildlife Act, 1974.*
   - Where seed collection involves species listed on Schedule 1 or 2 of the *Threatened Species Conservation Act, 1995,* a Section 91 licence or prior written permission from the Director-General should be obtained.

Cultural heritage

s) Recording and management of any newly identified Aboriginal objects, in consultation with DECC (and the Aboriginal community where applicable.)

Visitation and research

t) Visitation, research and community use at a level that does not adversely impact on the conservation values of the area or the amenity of the Owner. Research projects should be discussed with DECC.

u) for safety reasons, bushwalkers should not enter the defined 'danger zone'.

Developments

v) Carrying out developments described in Clause 2.3 of the Agreement, and maintaining developments (including existing fire trails and infrastructure) with the following conditions

- The width of internal roads and access tracks will be a maximum of 4.5 metres.
- Walking tracks will not be wider than 1.5 metres.
- Clear a corridor not greater than 3 metres wide during construction or for maintenance for the installation of fences or other agreed rural structures in Zones 2 and 3.
- Remove fallen timber and any other obstructions to maintain access.
- Where clearing is necessary, undertake all works in a manner that minimises disturbance to soil and hydrological characteristics.
- Remove old fences and close unwanted tracks within Zones 1 and 2 of the conservation area and facilitate restoration of native vegetation by allowing natural regeneration where required.
- Retain hollow bearing trees and stag trees along roads and tracks and within car park areas, where those trees do not pose a hazard to people or property.
- Development consistent with development consents for Zones 2 and 3.

Monitoring

w) A comprehensive, measurable monitoring program to be implemented to ensure that any potential pollution, sedimentation or contamination impacts from Zone 2 and 3 do not impact upon Zone 1, and that if any impacts are detected over time, that remediation is implemented immediately.

x) Annexure B contains dated aerial photographs/maps showing the location of the conservation area, the conservation values and photo-points. Photographs have been taken at these photo-points during the preparation of the Agreement. This provides baseline information and data for ongoing monitoring and adaptive management of the conservation area. Further photopoint photographs should be taken following any future development.

y) Photographs at the identified (and future) photo-points should be taken from time to time in consultation with DECC officers for the purposes of ongoing monitoring of the conservation values.

z) The Owner to complete a monitoring report on an annual basis, including photo-point photos, noting changes occurring in the conservation area. This will form the basis for decisions about ongoing management actions. A copy of all monitoring reports should be forwarded to DECC.

ITEM 2:
The Owner shall not undertake, consent to or permit (unless specified in Item 1 of Annexure C or with prior written consent of the Director-General)

a) the carrying or firing of firearms in Zones1 and 2 (if development approval is granted for Zone 2, firearms permitted as per approval conditions.) Firearms are not permitted to be directly and intentionally fired into any bushland in any zone.
b) the sowing or planting of trees, grasses or other plants in the conservation area
c) the introduction of any non-indigenous plants or non-indigenous fauna into the conservation area
d) the entry of domestic animals including pets and domestic livestock in the conservation area
e) the use or application of fertiliser or pesticides in the conservation area
f) the use of trail bikes, four wheel drive vehicles or any other vehicle in the conservation area off any formed road
g) any works in the conservation area, especially any revegetation work and developments, which have the potential to impact on any cultural features. (Seek advice from DECC if any are identified, prior to any work commencing)
h) the removal of any biological or inorganic component of the conservation area
i) any works which will adversely affect the natural flows and bodies of water.

_____ _____

Minister administering the *Sporting Venues Authorities Act, 2008*. Minister

Appendix C

Memorandum of Understanding

MEMORANDUM OF UNDERSTANDING

BETWEEN

SPORT AND RECREATION
(An agency of Communities NSW)

AND

PARKS AND WILDLIFE GROUP
(An agency of the Department of Environment, Climate Change and Water)

.....

DATE

MEMORANDUM OF UNDERSTANDING

DATE .....

Between

Sport and Recreation, an agency of the Communities NSW (ABN 96991098913) of 6 Figtree Drive, Sydney Olympic Park NSW 2127 (**'the Agency'**)

and

the Parks and Wildlife Group within the Department of Environment, Climate Change and Water (ABN 30 841 387 271) of 43 Bridge Street, Hurstville NSW 2220 (**'Parks and Wildlife Group'**)

1. Background

1.1 The State Sporting Venues Authority, pursuant to the Sporting Venues Authorities Act 2008, is the registered owner of 1,036 hectares of land at Lot 100, DP 1088254 at Wattle Ridge Road, Hill Top (**"Hill Top Site'**). The land was vested in the Authority for the purpose of establishing the Southern Highlands Regional Shooting Complex, Hill Top.

1.2 At the date of commencement of this Agreement, the Lot incorporates one 800m multi-purpose range subject to licence approval of the NSW Firearms Registry ('approved shooting range'). The range is subject to Conditions of Approval (Major Project Application 06_0232) issued by the Minister for Planning on 1st March, 2010 which permits the ongoing operation of the range on up to four days a week (including weekends) between the hours of 10:00am and 5:00pm. Provision exists for Special Events to be approved by the Department of Planning under certain circumstances where days/times of use could be varied.

1.3 The Southern Highlands Regional Shooting Complex Inc is licenced by the Agency on agreed terms to occupy and use the cleared area of land set aside for the 800m rifle range, adjacent club house and access road to Wattle Ridge Road, Hill Top.

1.4 The Hill Top Site was previously part of the Bargo State Conservation Area, and was managed by the Parks and Wildlife Group in accordance with the Nattai Reserves Plan of Management. The Parks and Wildlife Group continue to manage the surrounding land.

1.5 A Conservation Agreement pursuant to Section 69A-KA of the National Parks and Wildlife Act between the Minister for the Environment and the Minister for Sport and Recreation in respect to Lot 100, DP 1088254 has been signed and registered pursuant to Section 69F of the Act. This statutory Agreement commits the land owner (Minister for Sport and Recreation on behalf of the State of New South Wales) to take all necessary steps to protect and manage the conservation values of the Lot.

1.6 The Agency acts on behalf of the Minister for Sport and Recreation in respect to all ensuing obligations for land management responsibilities for the Lot arising from the Conservation Agreement and land management plans adopted by the Agency. It is acknowledged that these land management responsibilities fall to the agency as representative of the Authority, irrespective of any development consent conditions which might apply to the site from time to time.

1.7 The purpose of this Memorandum of Understanding (MOU) is to acknowledge and outline a collaborative and mutually supportive relationship between the Agency and the Parks and Wildlife Group whereby the Parks and Wildlife Group will provide the Agency with professional fauna and flora land management advice and assistance in respect to land within the Hill Top Site, excluding the cleared area that constitute the approved shooting range and club house area..

1.8 The land management advice will be directed to ensuring that the Agency and the licence holder of the approved shooting range on the Hill Top Site ensure that the environmental and conservation values of the site are maintained and managed consistent with the Nattai Reserves Plan of Management and the Conservation Agreement for the site. At all relevant times, the Agency and the licence holder bear responsibility for management of the Hill Top Site.
(NB. This advice excludes matters related to possible environmental impacts arising from operation of the range. Such advice may be provided from other Branches within the Department of the Environment, Climate Change and Water, Department of Planning and/or consultants specifically engaged by the Agency).

1.9 This MOU is not intended to give rise to legally binding rights or obligations between the parties.

2. Objectives

To protect and manage the flora and fauna conservation and environmental values within the Hill Top Site.

3. Term

3.1 This MOU shall commence from the date this MOU is executed by the last party and shall be for a term of five (5) years with an option for extension by mutual agreement between the parties.

3.2 If at any time during the term of this MOU the parties agree to vary any of the provisions of the MOU, the parties must document any changes in writing signed by both parties.

3.3 The parties agree to review the MOU after 12 months of operation and to make any amendments that may be required to appropriately reflect the terms of agreement.

3.4 Any disputes between the parties shall be referred to the respective Directors General for resolution.

4. Parks and Wildlife Group Responsibilities

4.1 The Parks and Wildlife Group will do the following:

4.1.1 Provide advice to the Agency regarding fauna/flora land management issues for the Hill Top Site including ecological restoration, wildlife management, bush fire mitigation measures, weed control and feral animal control etc.

4.1.2 Prepare and submit to the Agency for approval an annual works program for the Hill Top Site based on assessed land management priorities.

4.1.3 Implement an annual agreed works program of land management works on the Hill Top Site. It will remain the Agency's responsibility to implement its statutory environmental planning responsibilities on the site. The Parks and Wildlife Group will assist in implementing these responsibilities to the extent that they are identified and agreed by the Agency and the Parks and Wildlife Group in the annual works program. (NB. The Parks and Wildlife Group may be unable to undertake natural resource surveys on the Hill Top Site. These surveys would generally be undertaken by consultants. Surveys may be identified in the annual works program and project managed by the Parks and Wildlife Group and outsourced to external consultants).

4.1.4 Assist the Agency in protecting and conserving the natural and cultural heritage of the Hill Top Site.

4.1.5 Promote awareness, understanding and appreciation of the natural and cultural heritage values of the Hill Top Site in the context of broader community awareness initiatives for the Nattai Reserves.

4.1.6 Undertake environmental assessments required for day to day site management consistent with the terms of this Agreement. The Wingecarribee Shire Council or the Department of Planning will be the approval authority for any proposed works on the Hill Top Site.

4.1.7 Investigate and record Aboriginal sites on the Hill Top Site within the agreed land management program and liaise with the local Aboriginal community on their ongoing protection. The Agency will retain the legal obligation as land owner to ensure protection and preservation of Aboriginal sites and objects of significance.

4.1.8 Participate in and contribute to planning for incident control including fire fighting. (Note that all wildfire responses will be in accordance with the Rural Fires Act 1997 and the Wingecarribee Rural Fire Service District Operations and Coordination Plan. The Rural Fire Service will be the primary wildfire response agency supported by PWG).

4.1.9 Whilst implementing the agreed land management works program on the Hilltop site, will implement all reasonable Equity, OHS and EAPS policies and principles stipulated by the Agency.

4.1.10 Undertake administrative tasks to ensure accountability, communication and documentation of programs and resources.

4.2 The Parks and Wildlife Group agree to provide the following reports to the Agency:

4.2.1 In May each year, the Parks and Wildlife Group will submit to the Agency a draft annual works program that outlines the expected land management initiatives that will be undertaken by the Parks and Wildlife Group in the subsequent year on the surrounding land managed by the Parks and Wildlife Group and immediately adjacent to the Hill Top Site. The Parks and Wildlife Group agree to perform the same ecological management initiatives at the Hill Top Site.

4.2.2 In August each year, the Parks and Wildlife Group will submit to the Agency an end of financial year report on the achievements of reaching the targets in the previous years draft annual works program referred to at 4.2.1 above.

4.3 The Parks and Wildlife Group acknowledges that the Southern Highlands Regional Shooting Complex Inc has been licensed by the Agency to occupy and use an area of the Hill Top Site as a shooting range with access to a club house and access roads under a NSW Firearms Registry 'Shooting Range Approval'.

Accordingly, it agrees that before a representative/s of the Parks and Wildlife Group enters the Hill Top Site at any point in respect to fulfilling the terms of this Memorandum of Understanding, its representative/s will contact the Agency and/or the licence holder to ensure the Hill Top Site is safe to access.

In this respect, it is noted that the site is only permitted to be used as a multi-purpose range between the hours of 10:00am and 5.00pm on up to four days a week, including Saturday and Sunday.

5. NSW Sport and Recreation's Responsibilities

5.1 The Agency will do the following:

5.1.1 Provide an annual fee to the Parks and Wildlife Group for performing the above responsibilities in the sum of $30,000 payable on the date the Memorandum is executed by the last party (insert date), such fee to be adjusted on the anniversary date of its execution in line with annual CPI increases and for the duration of the term.

5.1.2 Work cooperatively with the Parks and Wildlife Group to identify potential areas of ecological concern at the Hill Top site and to conserve its natural and cultural heritage.

5.1.3 Ensure that representatives of the Parks and Wildlife Group have unimpeded access to the Hill Top Site, including a secure key access system, within terms agreed with the licence holder of the approved shooting ranges on the Hill Top Site in order to fulfil their responsibilities as detailed in Clause 4.1.

5.1.4 Provide the Parks and Wildlife Group relevant Agency policies and procedures to assist in fulfilling obligations under the Agreement.

5.1.5 Provide the Parks and Wildlife Group staff 'on-site' induction related to management and operational requirements of the site.

5.1.6 Maintain on-going liaison with representatives of the Rural Fire Service and the Wingecarribee District Bush Fire Management Committee.

5.1.7 Provide the Parks and Wildlife Group with all available natural and cultural heritage surveys undertaken on the site.

5.1.8 Enforce regulations to be promulgated pursuant to the Sporting Venues Authorities Act in respect to the use of the Southern Highlands Regional Shooting Complex by the licence holder.

5.1.9 Inform Parks and Wildlife Group of any changes in the approved operating times/days of the site as a shooting range or of any other variations in operating consent conditions/occupancy licence conditions for the site that would impact on this Memorandum of Understanding and require the parties to review the agreement.

6. General

6.1 Nothing in this MOU confers on the Parks and Wildlife Group any estate or interest in land and the ownership, possession and control of the Hill Top site, which shall at all times remain vested to the Minister for Sport and Recreation under the management of NSW Sport and Recreation and licence conditions agreed with the licence holder.

6.2 Nothing in this MOU shall constitute the relationship set out in this MOU as partnership, agency or employment between the parties.

6.3 Nothing in this MOU is to relieve either party of the obligation to comply with all laws applicable to it and nothing in this MOU is to be taken as fettering the discretion of either party as to the proper exercises of its statutory functions.

6.4 Nothing in this MOU affects the obligations of the Minister Administering the Sporting Venues Authorities Act under the terms of the Conservation Agreement detailed in Clause 1.6 and the Minister remains entirely responsible for ensuring compliance with that Agreement.

7. Contact Persons

7.1 The contact person from the Agency will be:

John Shipway, Manager, Strategic Projects, Properties and Venues, Sport and Recreation, Communities NSW

7.2 The contact person from the Parks and Wildlife Group will be:

Adrian Johnstone, Area Manager, Nattai Region

In witness the parties have signed this MOU on the dates indicated below.

For and on behalf of: **National Parks and Wildlife Group Department of Environment, Climate Change and Water**	For and on behalf: **Sport and Recreation Communities NSW**
Name: Bob Conroy	**Name:** Darryl Clout
Title: Executive Director, Parks Management, Department of the Environment, Climate Change and Water.	**Title:** General Manager, Sport and Recreation, Communities NSW
Signature:	**Signature:** D. L. Clout
Date:	**Date:** 7 . 10 . 10

Appendix D

Summary Table of Mitigation Actions

Table 16 Summary of fauna and flora management actions

Project Phase	Section of EMP	Mitigation Measure	Timing	Responsibility
Pre-construction Phase				
	Section 2.4	**Spring Surveys –** supplementary targeted surveys prior to the commencement of clearing activities to meet Project Conditions of Approval	September 2010	Land Manager (Communities NSW Ecologists)
	Section 6	**Induction –** to familiarise contractors with their obligations for protecting flora and fauna and with relevant flora and fauna management protocols and methods	October 2010	Site Manager (advised by Contractors Ecologists)
	Section 5.2.1	**Identify Disturbance Areas** – identify construction footprints and suitable sites for location of ancillary infrastructure	October 2010	Contractor's Site Manager
	Section 5.2.1	**Install Protective Fencing and signs** – high visibility temporary fencing and signs erected to clearly demarcate construction and works areas from surrounding native vegetation and habitats ('no-go zones'). Installation of signs at property access points to restrict off-road activities and fauna warning signs and speed signs at appropriate locations.	October 2010	Contractor with advice from Contractor's Ecologists where appropriate
	Sections 5.2.1, 5.3.1, 5.3.4	**Pre-clearance Surveys –** completion of pre-clearance surveys prior to vegetation clearance, in accordance with the *Fauna Habitat Identification Management Procedure*, and including: ◗ **Baseline weed mapping** in accordance with the Weed Management Strategy ◗ **Identification and of hollow-bearing trees and logs** to be cleared in accordance with the Habitat Clearing and Hollow Tree management procedure; ◗ **Identification of Wombat burrows** and installation of one-way wombat gates; ◗ **Inspection of termite mounds** for evidence of nesting by Rosenberg's Goanna and egg retrieval and management in consultation with DECCW; ◗ **Identification of rocky outcrops or ledges** within the construction footprint to be searched for native fauna immediately prior to clearing activities and removal; and ◗ **Identification of Hollow Trees and Yellow-bellied Glider sap-feeding trees** for	Late September 2010	Contractor's Ecologists Contractor's herpetologist/ or suitably experienced Wildlife Specialist

Project Phase	Section of EMP	Mitigation Measure	Timing	Responsibility
		retention in vicinity of car park and along access roads, where possible ; ◗ **Identification of transportable habitat features** (eg large logs, rocks) to relocate during clearing activities into retained habitats under advice of Contractor's ecologist.		
		Closure of unwanted tracks – close unwanted or unused tracks in vicinity of construction area to prevent unauthorised access	Late September/early October 2010	Contractor's Site Manager with direction from Land Manager
Construction Phase				
	Section 5.3.2	**Timing –** adhere to the set timing for clearing activities (June to October), clearing not to commence until completion of spring surveys and finalisation and approval of Ecological Management Plan.	September– October 2010	Contractor
	Section 5.3.2	**Operational hours –** construction works to occur during standard operational hours as far as possible to avoid impacts on fauna as a result light and noise. Night work should be avoided as far as possible and any necessary lighting located and directed to avoid light spill into retained habitats adjoining the construction area.	Throughout construction period	Contractor's Site Manager
	Section 5.3.2	**Maintain Fencing and Signs**– temporary fencing erected to demarcate construction areas and 'no-go zones' to be inspected and repaired as necessary.	Throughout construction period	Contractor
	Section 5.3.2	**Restrict Access –** restrict vehicle movements to access roads and construction areas to prevent mechanical damage to vegetation and soil disturbance in surrounding retained habitat	Throughout construction period	Contractor's Site Manager
	Section 5.3.2	**Enforce speed limits and safe driving practices** to minimise potential for fauna road mortality and disturbance of vegetation from dust generation	Throughout construction period	Contractor's Site Manager
	Section 5.3.2	**Install ancillary features –** locate temporary construction infrastructure (eg site office), equipment laydown and vehicle/machinery parking areas and stockpile sites within existing clearings or disturbed areas or within the construction footprint away from the drip line of trees as far as possible.	October 2010	Contractor's Site Manager
	Section 5.3.2	**Install sediment control features prior to clearing activities –** to prevent runoff from exposed soils and stockpiles to minimise the potential for adverse impacts on surrounding and downstream habitats in accordance with the Soil and Water Management Plan and Water Cycle Management Plans.	Early October 2010	Contractor

Project Phase	Section of EMP	Mitigation Measure	Timing	Responsibility
	Section 5.3.2	**Dust suppression –** spraying of access tracks and disturbed surfaces to control dust generation and minimise impacts on adjoining vegetation	Throughout construction period, as required	Contractor
	Sections 5.3.2 & 5.3.4, Appendix E	**Implement Habitat Clearing and Hollow Bearing Tree Management Procedure –** the removal of trees with hollows and hollow logs, wombat burrows, rocky outcrops, termite mounds is to be in accordance with this procedure to minimise potential for mortality or harm to fauna. Contractor's Ecologists to be present during vegetation clearing.	September 2010 – April 2011	Contractor/Contractor's Ecologists
	Sections 5.3.2 & 5.3.4, Appendix E	**Exercise caution around exposed sandstone and bushrock –** care taken to avoid disturbance or destruction of potential Broad-headed Snake habitat adjoining construction footprints.	Throughout construction period	Contractor
	Sections 5.3.2 & 5.3.4, Appendix E Section 8.1	**Implement Fauna Management and Fauna Handling Management Procedures** – where necessary, animals encountered within construction footprints should be managed in accordance with this procedure. All wildlife handling to be undertaken by the contractor's wildlife specialists. Document records of animal handling requirements and outcomes for inclusion in contractor monthly field inspection reports to inform Land Manager's Annual Report to DECCW.	September 2010 – April 2011	Contractor's Wildlife Specialists Contractor's Site Manager with assistance from contractor's Wildlife Specialists
	Section 5.3.2, 5.3.4 & Appendix E	**Reinstatement of Fauna Habitat Features Procedure –** identified transportable habitat features (eg hollow logs and trunks, rocks etc) within construction footprints to be relocated to adjacent habitat in accordance with this procedure.	During vegetation clearing activities	Contractor with advice from Contractor's Ecologists
	Sections 5.3.2 & 5.3.4, Appendix E	**Avoidance of Habitat Features Identified for retention during pre-clearing surveys–** hollow-bearing trees and Yellow-bellied Glider sap-feeding trees to be retained in the car park area and along access roads to be avoided during clearing and grading works, as far as possible.	Throughout construction period	Contractor
	Appendix E	**Retention of topsoil and vegetation debris –** topsoil removed for construction should be stockpiled for use in rehabilitation areas as required. Vegetation debris from clearing activities should be mulched and used for stabilisation of disturbed soils and in proposed rehabilitation/landscaped areas.	During vegetation clearing activities	Contractor
	Section 5.4 & Appendix E	**Weed Control –** adherence to a Weed Management Strategy. Use designated access points to reduce transport of weed material between areas. Workforce personnel to inspect clothing, boots and vehicles/ plant machinery on entry and exit from site. Manage	Throughout construction period	Contractor

Project Phase	Section of EMP	Mitigation Measure	Timing	Responsibility
		stockpiles to prevent weed germination. Weekly inspections of construction site and disturbed areas for new occurrences of weeds and weed removal.		
	Section 5.5 & Appendix E	**Implement Biosecurity Procedures –** boot wash down and vehicle spray down stations located at all access points to construction site. Phytoclean (*Phytophthora cinnamomi*), Bleach (Chytrid Fungus). Personnel boots and vehicles/ plant / machinery to be clean on entry and clean on exit. Any soil or water brought to the site is to be free of weeds or pathogens.	Throughout construction period	Contractor's Site Manager
	Appendix E	**Soil Stockpile Management –** locate stockpiles away from vegetated areas or drainage lines to prevent sediment discharge and spread of weeds. Ensure appropriate erosion and sediment controls are in place around soil stockpiles. Manage stockpiles to prevent weed germination in accordance with the Soil and Water Management Plan and Water Cycle Management Plans	Throughout construction period	Contractors
	Appendix E	**Rehabilitation of disturbed areas –** disturbed areas to be progressively stabilised and where appropriate planted with native species endemic to the local area in accordance with Rehabilitation Management Protocol and requirements of Bushfire Management Plan.	Throughout construction period	Contractors
		Waste Management – all chemicals and liquid wastes to be contained within bunded areas to avoid environmental contamination. Rubbish and organic waste to be disposed of regularly and appropriately in accordance with the Soil and Water Management Plan and Water Cycle Management Plans.	Throughout construction period	Contractor
	Section 8.1	**Site Inspections and Reporting -** Undertake daily site inspections and reporting in accordance with CEMP to report on environmental performance, incidents, non-conformance and remedial action to address incidents and non-conformances	Throughout construction period	Contractor's Site Manager
		Removal of fencing- temporary fencing is to be removed following the completion of the construction phase.	May/ June 2011	Contractor
	Appendix E	**Rehabilitation of disturbed areas –** disturbed areas to be progressively stabilised and where appropriate planted with native species endemic to the local area in accordance with Rehabilitation Management Protocol and requirements of Bushfire Management Plan.	May/ June 2011	Contractor
	Section 5.2.3	**Installation of permanent fencing –** install permanent fencing of the clubhouse and surrounds to minimise vegetation damage from vehicle and pedestrian movements on the site.	May/ June 2011	Contractor
Operational Phase				

Project Phase	Section of EMP	Mitigation Measure	Timing	Responsibility
	Sections 5.2.1and 7.1	**Photographs at Photopoints –** take photos at established photopoints and establish and log new photopoints in vicinity of new development, as per Conservation Agreement	September 2010	Land Manager
		Restriction of access to surrounding bushland- Restrict access to surrounding bushland and existing bushwalking tracks by: ◗ **Installing obstacles** to block vehicle access to tracks ◗ **Installing signs** to clearly demarcate walking trails and asking walkers to stay on marked trails ◗ **Maintaining internal roads** to ensure all-weather access for 4WD vehicles. No new roads to be created. ◗ **Manage illegal vehicle access** jointly with the NSW Police and National Parks and Wildlife Group, DECCW.		Land manager
	Appendix E	**Implement threatened flora management procedure-** prevent damage to disturbance loving threatened flora during maintenance activities by implementing procedures outlined in the threatened flora management procedure, including providing maintenance staff with inductions and species ID cards.	As required	Facility Site manager
	Section 5.3.3	**Introduce speed limits-** Introduce and enforce speed limits by installing signage and speed control structures (e.g. speed bumps) along roads to prevent fauna injury	May/June 2011	Contractor
	Appendix E	**Implement Management of Fauna on Range and Fauna Handling Management Procedures**– where necessary, animals encountered on the range during shooting hours should be managed in accordance with this procedure. All wildlife handling to be undertaken by the contractor's wildlife specialists. Document records of animal handling requirements and outcomes for inclusion in Land Manager's Annual Report to DECCW.	Ongoing	Facility Site Manager/ Land manager
	Section 5.3.3	**Limit nocturnal shooting activities-** nocturnal shooting activities to be kept to a minimum to minimise the disturbance to nocturnal fauna. Light should be located and directed to avoid light spill into surrounding habitats as far as possible.	Ongoing	Facility Site manager
	Section 5.3.3	**Regular removal of spent munitions-** shooting range and surrounds to be regularly cleared of spent munitions to avoid the potential for lead poisoning of fauna	Ongoing	Facility Site manager
	Section 5.3.3	**Manage illegal bushrock removal-** management of this issue to be undertaken in the Conservation (E2) zone and uncleared areas of the SP1 zone in conjunction with initiatives undertaken by the National Parks Group on surrounding conservation lands	Ongoing	Land manager

Project Phase	Section of EMP	Mitigation Measure	Timing	Responsibility
	Appendix E	**Weed Control –** adherence to the Weed Management Strategy. Use designated access points to reduce transport of weed material between areas. Annual weed surveys and control to be completed by a professional bush regenerator within the SP1 zone. It is intended that weed control in the Plan area will be integrated with PWG (Nattai area) weed management within the surrounding DECCW estate under the MOU between the PWG and Communities NSW (Sport and Recreation). Photos taken at established photopoints to compare pre and post construction environments	Ongoing	Land manager/PWG (Nattai area)
	Appendix E	**Implement Rehabilitation Management Procedure-** Any rehabilitation at the site to be undertaken in accordance with this procedure, using native species of local provenance and non-viable, non-invasive turf to prevent introduction of weeds	Ongoing	Land manager
	Appendix E	**Implement Biosecurity Procedures –**Any soil or water brought to the site is to be free of weeds or pathogens. All maintenance/monitoring equipment such as water quality monitoring equipment should be cleaned and disinfected between sites.	Ongoing	Land manager
	Section 5.5.5	**Undertake Phytophthora monitoring- S**urveys for Phytophthora dieback to be undertaken every 1-2 years, in conjunction with annual weed surveys. Soil and plant samples to be analysed from any areas of suspected dieback, and any infected areas should be isolated and managed in consultation with local National Parks officers.	Ongoing	Land manager
	Section 5.6	**Feral Animal Control** – It is intended that pest control in the Plan area will be integrated with PWG (Nattai area) pest management within the surrounding DECCW estate under the MOU between the PWG and Communities NSW (Sport and Recreation). Additional control programs to be undertaken if necessary, with advice from local National Parks officers and Rural Lands Board.	Ongoing	Land manager/PWG (Nattai area)
	Section 5.6	**Regular waste disposal** to prevent attraction and accumulation of feral animals to the site	Ongoing	Land manager
	Section 5.6	**Rabbit control measures-** install measures to control European Rabbit grazing pressure within the SP1 zone, including: ◗ Install tree guards/ protective fencing around regenerating vegetation; ◗ Undertake monthly rabbit monitoring: any observed increase in rabbit activity will trigger the preparation of a management plan in consultation with National Parks officers; and ◗ Control programs to be undertaken if necessary with advice from local National Parks officers and Rural Lands Board.	Ongoing	Land manager/PWG (Nattai area)

Project Phase	Section of EMP	Mitigation Measure	Timing	Responsibility
	Appendix C	**Finalisation and signing of Memorandum of Understanding** between Communities NSW) and Parks and Wildlife Group (agency of DECCW) (see Appendix C).		Land manager/PWG (Nattai area)
	Section 8.2	**Completion of Annual Report-** Land manager to complete the annual monitoring report for submission to DECCW, including: ◗ Photopoint photos for comparison of vegetation changes; ◗ Records of any threatened flora or fauna species encountered during operational activities; ◗ Summary and results of annual works program undertaken by the National Parks Group, as well as any additional control programs; ◗ Results of environmental monitoring surveys, inspections and analyses; and ◗ Incident reporting and actions.	Annually	Land Manager

Appendix E

Management Procedures

Management Procedures

This Appendix contains the specific Management Procedures to be implemented during the three stages of the proposed development (i.e. pre-construction, construction and operational phases) to minimise the potential for adverse impacts on native flora and fauna, including threatened species and their habitats. Management Procedures and appropriate phases for implementation are summarised in Table E1 and described in detail below.

Table E1 Flora and Fauna Management Procedures and Timing for Implementation

Management Procedure	**Pre-construction Phase**	Construction Phase	Operational Phase
Habitat Feature Identification Procedure (Pre-clearing surveys)	x		
Threatened Flora Identification and Management Procedure		X	X
Habitat Clearing and Hollow Tree Removal Procedure		X	
Fauna Management Procedure		X	X
Handling and Management of Fauna Procedure		X	X
Reinstatement of Fauna Habitat Features Procedure		X	
Biosecurity Procedures		X	X
Rehabilitation Procedure		X	X
Weed Management Strategy	X	X	X

Habitat Feature Identification Management Procedure

During the pre-construction phase of the project, surveys to identify important habitat features will be undertaken by the Contractor's ecologist(s) to:

- Identify and mark hollow-bearing trees and Yellow-bellied Glider trees to be retained in the vicinity of the proposed car park and along access roads;
- Identify and mark habitat features, including in particular hollow-bearing trees, within the construction footprint likely to be occupied by fauna that require careful management during clearing activities;
- Identify and mark habitat features such as rock outcrops or hollow-logs to be inspected for native fauna immediately prior to removal;
- Locate wombat burrows and install one-way gates;
- Inspect termite mounds for evidence of Rosenberg's Goanna eggs or other nests;
- Identify and mark transportable habitat features to be removed from the construction footprint during clearing and reinstated in adjoining habitats;

Hollow bearing trees/stags and Yellow-bellied Glider Trees to be Retained

Undertake a survey of the proposed car park area and site access track to identify hollow-bearing trees or Yellow-bellied Glider sap-feeding trees that should be retained where possible. Trees to be retained will be clearly identified by spray-painting an 'R' on the trunk.

Hollow bearing trees/stags and logs in Construction Footprint

Undertake a survey of the proposed construction area to locate hollow trees and check for signs of habitation (e.g. scratch, wear marks), also check tree for signs of use (e.g. scratch marks on trunk, branches) and immediate area surrounding tree for signs of animals (e.g. owl pellet or whitewash at base of tree). Trees with large openings to the hollow (greater than 30 cm) will be noted separately as potential nest sites for owls. The tree will be clearly identified by spray-painting an 'X' on the trunk. The trees will be further marked to one of the following categories:

- Hollow occupied or potentially occupied and/or potential owl nest site (marked with an 'H');
- Unoccupied/no obvious occupation sign present at time of survey (left un-marked).

Hollow logs will be marked as either:

- Hollow, potentially occupied (marked with a 'H'); or
- No obvious occupation signs present at time of surveys (left un-marked).

The contractor's ecologist to document information for each tree and log along with GPS coordinates, Diameter at Breast Height (DBH) (cm) and tree species (tree only, not possible for hollow bearing logs).

Once hollow bearing trees/ logs that are to be removed have been identified and clearly marked, they can be removed during the construction phase, following the Habitat Clearing and Hollow Tree Removal Procedure and Habitat Reinstatement Procedure (as appropriate).

Bushrock: undertake a survey to locate any areas of bushrock within the construction footprint or adjoining the footprint boundary. Areas of bushrock should be located using a GPS. Any bushrock within

the construction footprint should be inspected for fauna. Where fauna are detected a GPS record should be taken and the location marked with a 'H' for further inspection and animal retrieval and relocation immediately prior to clearing activities, if required. All other areas of bushrock within the construction area are to be re-inspected immediately prior to clearing.

Areas of bushrock adjoining the construction footprint boundary should be flagged or temporarily fenced to avoid accidental damage from machinery during construction activities.

Wombat Burrows: undertake a survey for wombat burrows within the construction footprint. Install 1-way wombat gates at openings of obviously active burrows. Gates will be left in place for a minimum of 1-2 nights (in consultation with DECCW as to the minimum number of nights) prior to clearing activities to allow resident animals to vacate. Upon gate removal, the burrows will be immediately destroyed to prevent re-entry and injury or mortality of fauna during removal.

Appropriate method for burrow destruction is being determined and will be included in the final Plan

Termite Mounds

The contractor's ecologist(s) to undertake a survey of termite mounds within the construction footprint to identify any evidence of nests. If nesting is suspected engage a qualified herpetologist to inspect termite mounds and to retrieve eggs for appropriate ex-situ care and management. Any requirement for egg removal should be discussed in consultation with DECCW to determine appropriate techniques and management requirements prior to egg retrieval.

Threatened Flora Management Procedure

A number of the threatened species identified as having the potential to occur on the site (e.g. *Acacia bynoeana*, *Grevillea parviflora* spp. *Parviflora, Persoonia acerose, Persoonia glaucescens and Persoonia hirsuta* – GHD 2008) are known to prefer/colonise disturbed areas such as road verges and the edges of clearings, and as such may germinate along access roads. There is potential therefore for these species to be impacted during access road upgrades during construction and routine maintenance of tracks during the operational phase of the development.

Staff involved in such maintenance activities will therefore undertake an induction to:

- Inform staff of the potential presence of these species and their conservation significance;
- Train staff in the identification of threatened flora species likely to be encountered. Staff will be provided with reference materials (e.g. identification cards) for threatened flora species likely to be occur on site; and
- Measures to be taken if these species are encountered will be detailed (see below).

If suspected threatened species are encountered on the site, maintenance activities or other activities likely to harm the species will be immediately suspended and the contractor's site manager/facility site manager (dependent on development phase) informed. The Contractor's site manager or facility site manager will arrange for:

- Positive identification of the flora species by the contractor's ecologist/Communities NSW's ecologist (as applicable); and
- An area search to determine the number of individuals occurring and the extent of the area in which they occur to be undertaken by the contractor's ecologist/Communities NSW's ecologist (as applicable).

If the presence of threatened species is confirmed the occurrence shall be reported to DECCW for advice on ongoing management of the affected area(s). If possible, the area in which the threatened species occurs should be fenced off and designated a ''no go' area to protect the species while management options are discussed. Maintenance activities or other activities likely to harm the species may only recommence on advice from the contractor's ecologists/Communities NSW ecologists (as applicable to the development phase) once the plant(s) has been identified as a non-threatened species, appropriate measures have been implemented to ensure its protection, or permission is obtained from DECCW.

Habitat Clearing and Hollow Tree Removal Management Procedure

Standing hollow bearing trees/stags that are identified during the pre-construction pre-clearing surveys (Section 5.3.1) that can not be avoided and are required to be felled within the construction footprints, must adhere to the following procedure:

- Prior to clearing within the delineated construction area, all vegetation surrounding a hollow-bearing tree (excluding other hollow-bearing trees) will be removed at least 24 hours prior to the hollow-bearing tree being removed;
- Prior to clearing surrounding vegetation, the area will be inspected by the contractors ecologist and wildlife specialist for the presence of fauna;
- Any other habitat resources that have been identified for removal (e.g. hollow logs, rocks etc) must be inspected for the presence of sheltering fauna before removal occurs;
- If animals are detected, they must be captured and released by the contractor's wildlife specialist, or gently encouraged to move into adjoining secure habitat (in accordance with the Fauna Management and Fauna Handling Procedures);
- If a Koala is detected, a temporary exclusion zone of minimum 30m radius must be established around the tree until the Koala vacates the tree of its own volition (this will usually be overnight);
- Following habitat inspections surrounding non-hollow-bearing vegetation can be cleared. This process will be monitored by the contractor's wildlife specialist who will be responsible for appropriately dealing with any fauna encountered. The designated wildlife specialist will document the outcomes of this process for provision to the superintendent for inclusion in reporting;
- At least 24 hours after the removal of surrounding vegetation, the hollow-bearing tree can be felled:
  - Prior to felling or removal, clearing machinery will be used to gently shake or 'bang' the habitat tree for a period of 2-3 minutes (dependant on tree health and structural integrity) to encourage any resident fauna to vacate hollows. Sticks, poles or other similar hand-held objects will also be used to hit the trunk of the tree or log at various points, to encourage animals to vacate the tree. The tree will be observed for at least 5 minutes prior to completing the action.
  - After the observation period, each tree will be felled at the base. The contractor's wildlife specialist will watch the careful cutting down and laying of the tree on the ground, ensuring that the hollow(s) are not placed against the ground. Once it has been deemed safe by the excavator operator to inspect each tree/ log, hollows will be inspected for fauna that may be present (uninjured, injured or deceased). Refer to the Fauna Management and Fauna Handling Procedures below for the various procedures. The wildlife specialist will document this process;
  - Felled habitat trees will be left on the ground overnight to allow exit of occupying fauna. Habitat trees will then be stockpiled for relocation in adjacent habitat to maintain resources in the area according to the Habitat Features Reinstatement Management Procedure.

A wildlife specialist(s) engaged by the contractor (the contractor's wildlife specialist) must be present for the duration of this procedure, with appropriate equipment for capture, holding and care of injured animals if required.

Fauna Handling Management Procedure

All handling of wildlife is to be undertaken by a wildlife specialist. The wildlife specialist(s) must be engaged by the contractor and present during clearing and is to be on call for assistance as required for the duration of construction activities.

Fauna encountered are not to be handled by construction staff at any time, unless instructed to do so by the wildlife specialist. Animals that require handling must not be approached until the wildlife specialist is present, unless in an emergency. In an emergency situation, the Contractor's Site Manager must seek the advice of the wildlife specialist if they cannot be present in time. The Contractor's Site Manager may obtain over the phone instructions to ameliorate the situation.

All native animals encountered will be treated humanely, ethically, and in accordance with relevant codes under the Prevention of Cruelty to Animals Act 1986, including:

- Australian code of practice for the care of animals for scientific purposes (NHMRC 2004);
- Code of practice for the welfare of wildlife during rehabilitation (DPI 2001); and
- Animal ethics considerations and protocols outlined in this document.

If an animal is considered at risk of injury or undue stress by the wildlife specialist, it is to be encouraged to vacate the area via knocking, banging or gently shaking the animal's shelter and will be directed into secure adjoining habitat. Where deemed necessary by the wildlife specialist, the animal may be required to be captured and released. Construction activities may proceed if they are not considered to pose a risk to the animal. Construction activities that are likely to negatively affect the animal must cease until the animal has been appropriately removed by the wildlife specialist.

Animal Capture and Handling

Where necessary, animals will be captured by the wildlife specialist using a safe and ethical technique, as is appropriate for the particular species. Animals will be captured and held in a receptacle appropriate for that species until release. All captive-held animals will be provided with food, water and warmth as is appropriate for the species. Each receptacle will only hold one animal at a time and will be cleaned and disinfected between uses to avoid the spread of disease (DPI 2001). Appropriate containers for temporarily holding various types of animals are:

- Small calico bag (~ 20 cm x 30 cm with cord to secure the opening): lizards, dragons, microchiropteran bats. Bag then slung from beam in a holding box until the time of release;
- Large calico bag or pillow slip (~ 60 cm x 90 cm with cord to secure the opening): Snakes, medium sized arboreal mammals. Bag then stored in a cardboard box with padding if required for transport;
- Cage trap (~ 30 cm x 30 cm x 60 cm): medium sized arboreal and ground-dwelling mammals (including feral cats and foxes). Trap to be covered with bag to reduce stress;
- Elliot trap: small mammals (e.g. Antechinus) and reptiles (e.g. lizards);
- Plastic 'lunch-box'- style container (~ 10 cm x 10 cm x 20 cm) with appropriate habitat features, some water (or dampened cloth) and air holes: frogs;
- Sealable containers (~ 1-2 litres): tadpoles;

- Small box/open container with appropriate material for nestlings;
- Capture and temporary holding of large native mammals (kangaroo, wallaby and mega-chiropteran bats) and injured animals will be discussed with DECCW on a case-by-case basis;
- Handling and containment of frogs will be done in accordance with the DECCW Frog Hygiene Protocol (DECC 2008) to prevent the spread of Amphibian Chytrid Fungus.

Protocol for Release of Uninjured Animals

Uninjured captured native individuals are to be immediately released at the nearest suitable habitat away from the construction area (DPI 2001) (e.g. <150 metres away for most fauna):

- 'Suitable locations' will include habitats that are considered appropriate for the species, as determined by the wildlife specialist (e.g. sufficient protective cover, habitat features likely to support adequate food and water (DPI 2001));
- For particular species (e.g., nocturnal species), the wildlife specialist may also determine that it is beneficial to hold the animal/s safely in an appropriate receptacle until (or after) sunset to reduce risks to the animal such as disorientation or attack from predators. The receptacle will be kept in a shaded or otherwise suitable location during the day so that the temperatures experienced by the animals are well within its normal range. At all times, the container will be kept in a secure location, under the responsibility of the wildlife specialist.

Feral animals are not to be released. The Wildlife Specialist is to take these animals to the local council pound (Wingecarribee Animal Shelter).

Protocol for Management of Injured Animals

If an injured animal is found within the construction area, then the Wildlife Specialist will apply first aid (if necessary) and immediately take this animal to a nearby veterinarian for assessment;

- For animals whose injuries can be repaired and that stand a good chance of a successful return to the wild (as determined by the veterinarian), they will be placed into the care of the nearest 'accredited party' experienced in the care of that particular animal species (such as a local WIRES carer);
- When injured animals have recovered sufficiently, they will be released safely near the point of capture by the wildlife specialist in suitable habitat (DPI 2001);
- Animals whose injuries have a poor chance of repair or for which a successful return to the wild is considered unlikely (as determined by the veterinarian - and as specified in the Prevention of Cruelty to Animals Act 1968) will be euthanized humanely by the veterinarian (DPI 2001); and
- Dead or euthanized animals will be disposed of thoughtfully and hygienically – either buried or securely wrapped and disposed of in the waste collection. The latter would not be appropriate for large animals (e.g. kangaroos).

Fauna Detected During Construction

The following management procedures are to be implemented during construction activities to avoid or minimise the potential for stress, injury or mortality of native fauna encountered on the development site. The pre-construction removal of habitat features and the installation of temporary protective fencing around construction activities aims to reduce the potential for fauna to be encountered during construction activities. However, it is likely that some animals will manage to re-enter an active construction area, and find themselves at a risk of injury or mortality. The following section describes the actions to be undertaken should an animal be found within a construction area.

All Native Fauna

A daily site walk over will be completed by the Contractor's Site Manager. On detection of fauna within the delineated construction area, the animal should be gently encouraged to vacate the site and be directed into areas of secure adjoining habitat. If the animal is trapped or stressed the Wildlife Specialist should be contacted and the animal removed in accordance with the Fauna Handling Procedure outlined above.

Fauna may also be detected within the construction area by the construction team during their standard daily activities. The construction team will immediately inform the Contractor's Site Manager if this occurs. The Contractor's Site Manager will determine if the animal is at any risk of injury or mortality with advice from the Wildlife Specialist. If yes, then:

- All construction activities that contribute to the risk of injury, mortality or stress to the animal will be halted until the animal has been removed by the contractor's Wildlife Specialist, which will be enforced with the co-operation of the Contractor's Site Manager; and
- The contractor's Wildlife Specialist will capture and release the animal in accordance with the measures identified in the Fauna Handling Management Procedure, above. Activities that are not likely to increase the risk of injury, mortality or stress to the animal can continue (on advice of the Wildlife Specialist).

Construction activities that have been halted at a site due to the presence of an animal cannot recommence until the contractor's Wildlife Specialist has successfully captured the at-risk animal from within the construction area, and informed the Contractor's Site Manager that the animal is no longer at risk.

Threatened Species

The site is known habitat for a number of threatened fauna species, and all possible impact mitigation measures for these species will be implemented. If threatened fauna are detected on the site during construction, they will be handled by the contractor's Wildlife Specialist in accordance with the above procedure for native animals and the protocol for habitat clearing. All sightings of threatened fauna species must be recorded for inclusion in annual reporting.

Injured Fauna

Any sick or injured fauna encountered on the site should be captured by the contractor's Wildlife Specialist in accordance with the Fauna Handling Procedure above. The extent and probable cause of

the injury should be assessed by the contractor's Wildlife Specialist and the animal taken to the nearest available veterinarian for treatment or humane euthanasia if necessary, as detailed below.

Pest Animals

Pest animals recovered from the construction area will be removed. This will be co-ordinated by the contractor's Wildlife Specialist in accordance with the Animal Handling procedure above. Any pest animals found within the construction site are to taken to the local council pound (Wingecarribee Animal Shelter).

Reporting

A Project Register must be maintained by the Contractor's Site Manager detailing any incidences of fauna retrieval/removal from within construction areas. Each entry must include:

- The date, time and location of incident;
- The name of the Wildlife Specialist that handled or captured the animal;
- The species, sex and condition of the animal (if possible); and
- The action taken and its result.

If the animal is injured or unwell the entry must detail the type of injury, the cause (if known) any treatment given and the outcome.

This information will be provided to Communities NSW for annual reporting to DECCW.

Fauna Detected on the Shooting Ranges

Any fauna detected on the ranges and considered to be at risk of injury or undue stress should be gently encouraged to leave the area and directed into adjoining habitat, if possible. If necessary, however, the animal(s) may need to be captured and released into adjoining secure habitat, in accordance with the Fauna Handling Procedure outlined above.

In the unlikely event that fauna enter the site during shooting activities, or if fauna are only detected once such activities have commenced, all shooting must cease until the animal has vacated the area or been removed to a safe distance.

Uninjured animals are to be released immediately by a Wildlife Specialist to an area 150m from the clearing boundary and in habitat suitable to the species. The Wildlife Specialist may elect to hold the animal for a period of time prior to release, particularly in the case of nocturnal species or where there is risk of predation.

Injured animals are to be assessed by a veterinarian. Animals with a good chance of recovery are to be placed with a qualified carer and are to be released on the advice of a veterinarian. Where injuries are substantial and there is little chance of successful recovery the animal will be humanely euthanized by a veterinarian.

All animals must be captured, handled and held under the supervision of a Wildlife Specialist and in accordance with the animal handling procedure. Records must be maintained of any animals that are detected and removed from the range for inclusion in annual reporting.

Reinstatement of Habitat Features Management Procedure

Habitat resources, including hollow-bearing branches, logs, trunks and large rocks identified during the pre-clearing surveys are to be initially inspected for native fauna by the contractor's ecologist and Wildlife Specialist prior to clearing. These resources will then be temporarily stockpiled and then relocated as soon as practicable into adjoining areas of retained habitat.

Replaced habitat resources must be evenly distributed throughout areas of suitable habitat adjoining the site, and not piled at the edges of clearings or along access roads. Dispersal of branches, logs and rocks should be undertaken under the supervision of the contractor's ecologist, and with minimal disturbance to native vegetation.

Biosecurity Management Procedure

This biosecurity protocol is to be adhered to for the duration of the project – during pre-construction, construction and for all machinery and workforce required during the operational phase of the project (i.e. required for rehabilitation works and monitoring).

The purpose of the biosecurity protocol is to minimise the potential for the introduction and spread of pathogens and disease (particularly Phytophthora and Amphibian Chytrid Fungus). The protocol aims to achieve this by prescribing hygiene standards for all equipment, footwear and vehicles entering and exiting the site. The implementation of hygiene standards to prevent the introduction and spread of pathogens and weeds is a requirement of approval according to the Determination of Major Project No 06_0232 (DoP 2010).

The following hygiene standards are to be implemented:

- All footwear, construction, maintenance and monitoring equipment and machinery and vehicle exteriors should be clean and dry when entering the site. Specifically, they should be free of excess soil, to avoid transmission of Phytophthora spores and be clean and dry to prevent the transmission of Amphibian Chytrid Fungus zoospores. A biosecurity log book is to be completed with date, personnel/ vehicle and entry point noted;
- Clean on entry and clean on exit procedures will apply for personnel and machinery and vehicle and footwear washdown sites are to be established at construction site access points, using Phytoclean for Phytophthora and bleach for Chytrid fungus;
- Any equipment previously used in wet areas (including monitoring apparatus, footwear and vehicle tyres) should be cleaned with an appropriate disinfectant (bleach), or refer to Frog Hygiene Protocol (NPWS 2001) before entering or exiting the site;
- Vehicles must remain on designated access roads and parking areas. If this is not possible during construction or maintenance activities, tyres must be clean, dry and free of soil before use;
- Visitor vehicles should be restricted to designated car park areas;
- Pedestrian access is to be restricted to the shooting range and designated access roads and walking paths. If this is not possible, footwear and clothing must be free of soil and seeds, and footwear must be clean and dry.

With respect to construction and operational activities on site the following applies:

- Any imported soil or raw material must be sourced from disease free areas; and
- Any water used for irrigation or fire fighting to be sourced from phytophthora-free areas.

Rehabilitation Management Procedure

The rehabilitation management procedure is to be implemented during the construction and operational phases of the development. This management procedure will aim to:

- Facilitate natural regeneration of areas disturbed during construction within Zone SP1 [the area surrounding infrastructure, as outlined in the Conservation Agreement (2010), see Figure 2] and closed access tracks;
- Assist rehabilitation through supplementary planting where natural regeneration is not feasible;
- Minimise the potential for erosion and sediment discharge from disturbed areas;
- Minimise the potential for weed establishment in disturbed areas;
- Supplement fauna foraging resources through replanting of native locally endemic species in appropriate areas, as required; and
- Minimise the potential for degradation of surrounding native bushland by invasive exotic species.

Rehabilitation and landscaping (if required) and of areas disturbed during construction will occur as soon as practicable. This will be completed by undertaking the following:

- Topsoil replacement: topsoil stockpiled during construction will be used in landscaping and rehabilitation areas as required. In the event that imported topsoil is required, it should be sourced locally and certified weed and pathogen free;
- Mulching: mulched vegetation debris that is generated from the construction phase will be replaced over returned topsoil. This will help to reduce soil runoff and erosion, as well as increase natural regeneration potential. Erosion and sediment control fencing should also be installed as a preventative measure if required;
- Native species planting: once topsoil and mulch have been spread, areas to be landscaped will be planted with endemic native species of local provenance. Species selection will reflect vegetation types naturally occurring at the site. Suggested species are listed in Appendix G;
- Habitat trees: tree species known to be used as a food source by the Koala and Yellow-bellied Glider should also be used in landscaping and revegetation areas (Appendix G); and
- Turfed areas: sterile, non-invasive turf must be used for areas to be grassed.

Rehabilitation activities (including the application of vegetative mulch, location for revegetation activities and selection of plants) will be undertaken with consideration of the requirements for asset protection zones (APZ) and strategic fire advantage zones (SFAZ) identified in the Bushfire Management Plan (GHD 2010e). All activities will be undertaken in accordance with the Weed Management Strategy.

Adaptive management techniques may need to be employed to ensure rehabilitation is successful. For example, where replanted native vegetation is being extensively grazed, the installation of temporary fencing may be required, to maximise establishment of new vegetation.

Weed Management Strategy

This Weed Management Strategy has been prepared to fulfil the obligations outlined in the Conservation Agreement and the Conditions of Consent for the project.

Weed control at the Hill Top Site will form a component of the agreed annual works program to be undertaken by the Parks and Wildlife Group, as outlined in the draft Memorandum of Understanding between the Group and Communities NSW. All ecological management initiatives, including weed control, undertaken in surrounding lands managed by the Parks and Wildlife Group will also be undertaken in the Plan area. A report on the annual works and the targets met by the program will be submitted to Communities NSW at the end of each financial year.

In addition to the annual works program, specific weed management actions will be undertaken within the development areas and surrounds in zone SP1, as outlined below.

Weed Monitoring and Control:

- Existing weeds to be surveyed and mapped by the contractor's ecologists within the vicinity of construction sites and adjoining areas of native vegetation during pre-clearing surveys to identify current baseline weed levels, inform future management and to enable comparison of pre- and post-construction environment;
- Vegetation photopoints to be established in vegetation adjoining the development areas as per Conservation Agreement. Photos will be taken at the established photopoints to compare with pre-construction conditions (as per Conservation Agreement);
- Annual weed surveys to be completed by a professional bush regenerator (as per Conservation Agreement), to compare the pre (zero or negligible weeds) and post construction environments;
- Any weed outbreaks identified in yearly surveys of the SP1 zone (above) to be treated by a professional bush regenerator using appropriate control techniques, as per the Conservation Agreement (2010):
  - Use glyphosate based herbicide by direct application to cut surfaces (cut and paint or scrape and paint methods)
  - Remove weeds by hand ensuring that all plant parts which can reproduce are removed and that soils do not become prone to erosion.
  - Other weed control methods may be undertaken with prior written permission of the Director-General of DECCW.
  - Ensure control programs are commenced when timing and extent of weed removal will minimise adverse effects on wildlife (weeds may provide protection or habitat for native fauna).

Access Restrictions

- Use of designated site entry points to minimise interaction with surrounding areas;
- Access to surrounding bushland limited to existing bushwalking tracks, which should be clearly signposted;
- During construction, vehicle movement restricted to access roads and construction areas as far as possible; and

- Post-construction, vehicular traffic to be restricted to designated access roads and parking areas. Block off/ restrict vehicular access to tracks through surrounding bushland by installing bollards/ large rocks and boulders (obstacles).

Management Actions during Construction Phase

- Minimise the construction footprint and soil and vegetation disturbance as far as practicable;
- Provide induction to familiarise personnel with Weed Management strategy;
- Wash down stations provided during construction phase with high pressure hoses to remove mud that may potentially contain seeds/ burrs to be established at access points;
- Seeds, burrs or plant material must be removed from clothing, footwear, equipment and vehicles before entering the site during construction phase;
- Retained mulch material (native vegetation) to be spread on exposed soils following construction activities;
- Management of soil stockpiles to prevent weed germination in accordance with Soil & Water Management Plan;
- Place stockpiles that may contain seed or propagules of weeds away from vegetated areas or drainage lines to prevent spread of weeds during rainfall events; and
- Transport of weed propagules in runoff to be controlled by implementation of the Soil and Water Management Plan.

Appropriate Rehabilitation

- Implement Rehabilitation Management Procedure;
- Progressively stabilise and rehabilitate any disturbance to the natural environment during construction in accordance with Rehabilitation Procedure;
- Any landscaping or assisted regeneration at the site will be undertaken using native plant species of local provenance;
- Use of non-viable, non-invasive turf in grassed areas; and
- Rehabilitate unused/unwanted tracks through surrounding bushland via natural regeneration method, supplement with plantings if required.

Reporting

- Results of annual weed inspections and weed management activities undertaken to be documented in an annual report prepared by the bush regenerator.

Appendix F

Targeted Spring Surveys

Contents

Table Index

1. Introduction

The NSW Department of Planning's (DoPs) Conditions of Approval for the Southern Highlands Regional Shooting Complex (SHRSC) include a requirement to include additional spring surveys and reporting in the Ecological Management Plan, including surveys for "koalas, owls and microbats" (Schedule 2, Part B2). The following surveys have been undertaken to meet this requirement and to meet recommendations for additional flora and fauna surveys in the Supplementary Ecological Impact Assessment Report for the Project (GHD 2008):

- **October 2008:** A 3-day/2-night survey between the 21st and 23rd October 2008. Conditions during the survey were unseasonably wet and cool, and the surveys consequently were considered by DoP to be insufficient to satisfy the Conditions of Approval;
- **November 2009:** surveys were commenced on the 23rd November 2009, but had to be suspended after 2 days/2 nights due to legal considerations pending the outcome of a community action in the Land and Environment Court; and
- **September 2010:** A 10-day/ 8-night survey was undertaken between 31st August-2nd September and 6th-12th September. Conditions were close to the climatic average for September in Bowral, with an average minimum temperature of 6.0 °C (climatic average 5.1 °C) and maximum of 15.0 °C (climatic average 16.2 °C).

The following section details the survey effort, techniques and results from these three survey periods.

2. Survey Methodology

Targeted seasonal surveys were undertaken for the Koala, forest owls and microchiropteran bats as specified in the Conditions of Approval for the project, and for the threatened orchid species *Cryptostylis hunteriana,* as identified in the mitigation chapter of the Supplementary Ecological Assessment (GHD 2008). Supplementary surveys were also undertaken for *Acacia bynoeana*, *Persoonia acerosa*, *P. hirsuta*, *P. bargoensis*, *P. glaucescens* and *Grevillea parviflora* subsp. *parviflora.* These threatened plants were identified as species with the potential to occur in the Ecological Impact Assessments prepared for the Project (GHD 2007, 2008).

In addition, supplementary surveys were conducted for threatened herpetofauna (frogs and reptiles) and arboreal mammals which could potentially occur in the project area given previous records in the locality and suitable habitats present.

Survey techniques and effort across the three survey periods is documented in Table 3. Survey locations for each of the three survey periods are shown on Figures B1 and B2.

2.1 Targeted Surveys for Nominated Species

2.1.1 Forest Owls

Targeted surveys for the following threatened forest owl species were undertaken:

- Barking Owl *Ninox connivens;*
- Masked Owl *Tyto novaehollandiae;*
- Powerful Owl *Ninox strenua; and*
- Sooty Owl *Tyto tenebricosa.*

Owl call-playback surveys comprised an initial listening period of 15 minutes after which the call of each targeted owl species was broadcast for five minutes, followed by a ten minute listening period before the next species was played. This was followed by a 10-minute listening period and subsequent spotlight survey in surrounding habitat.

Stagwatches of potential roost trees were also undertaken from half an hour before until one hour after sunset, to observe the emergence of any forest owls or other arboreal or volant fauna. Roost trees were identified during the course of diurnal surveys, and were chosen based on the size and number of hollows with potential to support owls or arboreal and volant fauna and any evidence of occupancy (such as scratches on the trunk, whitewash or regurgitated pellets).

Forest Owls were also targeted in nocturnal spotlighting surveys (conducted on foot).

2.1.2 Microchiropteran Bats

Targeted surveys for microbats that could potentially occur in the study area were undertaken using a combination of Anabat call detectors, harp traps and spotlight and stag watch surveys.

Harp traps were erected near waterbodies and in potential 'flyways' (such as tracks and paths between trees) at dusk and checked and dismantled at dawn.

Spotlight surveys along tracks and around waterbodies were undertaken to detect foraging microbats in the study area. Stagwatches of potential roost trees were also undertaken from half an hour before until one hour after sunset, to observe the emergence of any microbats.

Two Anabat SD-1 detectors were placed in appropriate flyways and near small dams in different locations within and adjacent to the study site to determine the presence of microbats. The Anabat detectors were set at dusk and collected at dawn. Recorded calls were analysed by Ray Williams of Ecotone Consultants and Craig Grabham of GHD.

Calls were identified using zero-crossing analysis and AnalookW software by visually comparing call traits (version 3.6g, Chris Corben 2009). *Region based guide to the echolocation calls of microchiropteran bats: Sydney Basin* (Pennay et al. 2004) was used as a guide to call analysis. Due to the high level of variability and overlap in call characteristics, a conservative approach was taken when analysing calls.

A call (pass) was defined as a sequence of three or more consecutive pulses of similar frequency. Pulses separated from another sequence by a period of five seconds were considered to be separate passes. Scattered sequences, where intermittent pulses were not separated by more than five seconds, were recognised as a single pass. Where constant activity was recorded, a single pass was defined as 15 seconds (i.e. one full display screen comprising as Anabat sequence file) (Law et al., 1998; Law et al., 1999).

Due to variability in the quality of calls and the difficulty in distinguishing some species the identification of each call was assigned a confidence rating (see Mills et al. 1996 & Duffy et al. 2000) as summarised in Table 1.

Table 1 Confidence ratings applied to calls

Identification	Description
D - Definite	Species identification not in doubt.
PR - Probable	Call most likely to represent a particular species, but there exists a low probability of confusion with species of similar call types or species call lacks sufficient detail.
PO - Possible	Call characteristics are comparable with the species, but there exists a reasonable probability of confusion with one or more bat similar species or quality or length of call prohibits a confident identification.
Species Group	Call made by one of two or more species. Call characteristics overlap making it to difficult to distinguish between species e.g. *C. gouldii/ Mormopterus sp. 2* *Nyctophilus* spp. The calls of *Nyctophilus geoffroyi* and *N. gouldi* cannot be distinguished during the analysis process and are therefore grouped together.

2.1.3 Koala

Targeted surveys for the Koala *Phascolarctos cinereus* were focussed in areas not specifically surveyed during the previous fauna investigations, including the shotgun range and the existing range. Surveys comprised:

- Random meander transects to detect mature food trees (generally Grey Gums *Eucalyptus punctata*);
- Koala spot assessments (Koala SAT), following the technique outlined by Phillips and Callaghan (submitted), comprising searches for scats under identified and surrounding food trees (total of 31 trees for each spot assessment). Trees were inspected for scratches and canopies scanned to detect any individuals present;
- Spotlighting surveys (on foot) targeting the Koala and other nocturnal fauna were also undertaken; and
- Koala call playback.

2.1.4 Targeted searches for *Cryptostylis hunteriana* and other threatened flora

Targeted 'random meander' area searches were undertaken for threatened flora, including *Cryptostylis hunteriana* in areas of potential habitat at the site. Random meander surveys involve systematically searching an area of suitable habitat, rather than using a formal transect or quadrat which may miss rare individual plants.

Targeted surveys for *Cryptostylis hunteriana* were undertaken by two GHD ecologists in areas of potentially suitable habitat during the known flowering period for this species (November to February) on the 23rd and 24th November 2009 as part of the supplementary spring surveys. This species was also surveyed for on an opportunistic basis during other flora and fauna surveys conducted throughout the site during the two-day survey period (i.e. field ecologists were continually scanning areas of potential habitat for flowering individuals whilst undertaking targeted surveys for other threatened plants and during fauna surveys, such as Koala scat searches that require close and careful inspection of groundcover). As noted in Section 0, the field surveys were suspended after 2 days/2 nights due to legal considerations pending the outcome of a community action in the Land and Environment Court.

Cryptostylis hunteriana does not appear to have strong habitat preferences and has been found in a variety of different vegetation types across its range (DEWHA 2010, DECCW 2010b). Within dry sclerophyll forests such as those found at the site, the species appears to prefer open areas in the understorey (DECCW 2010b). Priority was therefore given to surveying such areas, but given the uncertainty in the habitat associations of this species random meander surveys also passed through areas of thick understorey and wetter gully habitat at the site. Survey locations are presented on Figure B-1.

Searches for other potential threatened plant species

Additional targeted surveys were undertaken for the following disturbance colonising species with potential to occur in the study area: *Acacia bynoeana*, *Persoonia acerosa*, *P. hirsuta*, *P. bargoensis*, *P. glaucescens* and *Grevillea parviflora* subsp. *parviflora* (see Figure B-1). Surveys were undertaken during known flowering periods as well as at other times and focused on areas to be directly affected by construction and in particular the margins of access tracks and fire trails.

Threatened species flowering times and details of survey timing and effort (including surveys undertaken for the Ecological Assessments (GHD 2007, 2008) and supplementary spring surveys) is summarised in Table 2 below. Total survey effort for threatened plants and vegetation during spring surveys is summarised in Table 3.

Table 2 Surveys for threatened plants

Species	Flowering time (DECCW threatened species profiles)	Surveyed during flowering time?	GHD survey effort
Persoonia acerosa	"*Persoonia acerosa* can be surveyed at any time of year, though the species is more readily detected when flowering during summer and autumn" (NPWS 2000b).	Yes May 2009 (autumn)	Targeted surveys for *P. acerosa* were undertaken for the Supplementary Ecological Assessment (GHD 2008). These surveys were targeted given they were conducted during the recommended survey period (Autumn) and focussed heavily on the margins of fire trails and access tracks through the site. NPWS (2000b) notes that "effort should concentrate on but not be restricted to disturbance margins such as road and trail verges and the edges of cleared sites adjoining bushland." In addition, random meanders as well as survey quadrats were also undertaken throughout the site (see GHD 2008: Section 3.5.2 and Figure 2). Surveys for *P. acerosa* outside of the flowering period have been undertaken along firetrails and access tracks during the original surveys in October 2006 (GHD 2007) and the November 2009 and September 2010 Spring surveys.
Persoonia hirsuta	November to January	Yes November 2009	Targeted surveys for *P. hirsuta* were undertaken for during the November 2009 Spring surveys. These surveys were targeted given they were conducted during the recommended survey period (Autumn) and focussed heavily on the margins of fire trails and access tracks through the site. Surveys for *P. hirsuta* outside of its flowering period have been undertaken along firetrails and access tracks in October 2007, May 2008 and and September 2010. Total survey effort for threatened plants and vegetation is summarised in the table below.
Persoonia bargoensis	"*Persoonia bargoensis* is best surveyed for during flowering in summer and autumn" (NPWS 2000a)	Yes May 2009 (Autumn)	Targeted surveys for *P. bargoensis* were undertaken for the Supplementary Ecological Assessment (GHD 2008). These surveys were targeted given they were conducted during the recommended survey period (Autumn) and focussed heavily on the margins of fire trails and access tracks through the site. NPWS (2000a) notes that *P. bargoensis* tends to occur along the margins of fire trails or similar disturbance and survey effort should concentrate on the margins of disturbed areas. Random meanders as well as survey quadrats were also undertaken throughout the site (see GHD 2008: Section 3.5.2 and Figure 2). Surveys for *P. bargoensis* outside of its flowering period have been undertaken along firetrails and access tracks in October 2007, November 2009 and September 2010.

Species	Flowering time (DECCW threatened species profiles)	Surveyed during flowering time?	GHD survey effort
Persoonia glaucescencs	Although *Persoonia glaucescens* is identifiable throughout the year, it is more readily detected during the flowering period which occurs in late summer and in autumn (NPWS 2000c).	Yes May 2008	Targeted surveys for *P. glaucescens* were undertaken for the Supplementary Ecological Assessment (GHD 2008). These surveys were targeted given they were conducted during a known flowering period (Autumn) and focussed heavily on the margins of fire trails and access tracks through the site. NPWS (2000c) notes that Surveys should be conducted along disturbance margins as this is where the vast majority of specimens will be present. Random meanders as well as survey quadrats were also undertaken throughout the site (see GHD 2008: Section 3.5.2 and Figure 2). Additional surveys for *P. glaucescens* outside of the flowering period have been undertaken along firetrails and access tracks during October 2007 and the September 2010.
Acacia bynoeana	*A. bynoeana* is identifiable throughout the year but may be more readily detected when in flower (NPWS 1999)	Yes November 2009 September 2010	Targeted surveys for *A. bynoeana* were undertaken during spring surveys in November 2009 and September 2010. This species seems to preferentially inhabit trail margins (NPWS 1999). Surveys focussed heavily on the margins of fire trails and access tracks through the site. Random meanders as well as survey quadrats were also undertaken throughout the site (see GHD 2008: Section 3.5.2 and Figure 2). *A. bynoeana* can be identified throughout the year and surveys for *A. bynoeana* outside of the flowering period have been undertaken during the October 2007 field surveys (GHD 2007) and in May 2008 for the Supplementary Ecological Assessment (GHD 2008). These surveys also focussed heavily on the margins of fire trails and access tracks through the site but also included random meanders and survey quadrats throughout the site (see GHD 2008: Section 3.5.2 and Figure 2).
Grevillea parviflora	Has been recorded from between July to December and in April and May (NPWS 2002a, b)	Yes May 2008	Surveys were undertaken in May 2008 during a potential flowering period for this species as part of the Supplementary Ecological Assessment (GHD 2008). These surveys included targeted searches for threatened species along the disturbed margins of access tracks and firetrails as well as random meanders through the proposed development footprints and adjoining areas (GHD 2008). Samples of Grevilleas encountered were sent to the RBG for species verification.
Cryptostylis hunteriana	Between November and February	Yes November 2009 Spring Survey	The 2009 surveys commenced on the 23rd November 2009 but were suspended at the request of Communities NSW after two days on the basis of the court proceedings and concerns

Species	Flowering time (DECCW threatened species profiles)	Surveyed during flowering time?	GHD survey effort
			over site access rights. Targeted surveys for C. hunteriana were undertaken in areas of potentially suitable habitat on the 23rd and 24th November 2009 by two GHD ecologists as part of the supplementary Spring Surveys. This species was also surveyed for on an opportunistic basis during other flora and fauna surveys conducted throughout the site during the two-day survey period (ie field ecologists were continually scanning areas of potential habitat for flowering individuals whilst undertaking targeted surveys for other threatened plants and during fauna surveys, such as Koala scat searches that require close and careful inspection of groundcover).

2.2 Additional Surveys

Additional targeted surveys were undertaken for a number of threatened fauna species that were not recorded during the previous surveys in the study area, but which could potentially occur given the presence of suitable habitat and their known occurrence in the wider locality. Supplementary birds surveys were also undertaken and records kept of all fauna species observed or heard during the targeted surveys throughout all survey periods.

Squirrel Glider

Supplementary call playback surveys were undertaken for the Squirrel Glider *Petaurus norfolkensis*. Surveys started with an initial listening period of 15 minutes and then calls of the Squirrel Glider were broadcast for five minutes. This was followed by a 10-minute listening period and subsequent spotlight survey of the surrounding area.

Reptiles

Targeted habitat searches for the following threatened reptile species were undertaken in the study area:

- Broad-headed Snake *Hoplocephalus bungaroides*
- Rosenberg's Goanna *Varanus rosenbergi*

Surveys for the Broad-headed Snake involved searches along the sandstone outcrops in the vicinity of the proposed shotgun range, involving searches of rock ledges and crevices and under rock on rock (exfoliating rocks). Termite mounds encountered during random meanders and spotlight transects were inspected for evidence of disturbance to identify potential Rosenberg's Goanna nesting activity.

Amphibians

Targeted surveys for the threatened Giant Burrowing Frog *Heleioporus australiacus* were undertaken at dams located on the ridgetops within the study area and involved diurnal and nocturnal spotlight searches of the dams and surrounding vegetation and tracks and temporary pools. Dip-nets were used to survey for the presence of tadpoles.

The Red-crowned Toadlet *Pseudophryne australis* is not anticipated to occur in the proposed development areas but may potentially occur down-slope within adjoining gullies. This species is known to respond to loud noises and was targeted by making loud vocalisations and handclapping along ridgetop/gully edges.

Incidental records of other frog species heard or observed during the targeted surveys outlined above were also noted.

Birds

Supplementary bird surveys were undertaken at dawn following checking of harp traps and retrieval of anabats and at dusk during stag watches.

2.3 Survey Effort and Techniques

A summary of survey techniques and effort is presented in Table 3. Survey locations are presented on Figures B-1 and B-2.

Table 3 Survey techniques and survey effort for Spring Surveys

Target Species/Guild	Sampling Technique	Units	2008	2009	2010
FAUNA					
Microbats	Harp traps	Trap nights	4	4	10
Microbats Anab	at	Trap nights	6	4	14
Forest Owls	Call playback	Survey nights	3	3	8
Koala	Spot searches	Koala SAT	1	1	8
Koala	Call Playback	Survey nights		2	
Koala/Forest Owls/other	Spotlight transects	Person-hours	8	2.5	9.5
Squirrel Glider	Call playback	Survey nights	3		1
Yellow-bellied Glider	Call playback	Survey nights		1	2
Forest Owls/Arboreal Mammals/ Microbats	Stagwatches Surve	y nights			8
Mammals/Reptiles/ Frogs/Avifauna	Spotlight transects	Person-hours 8		2.5	9.5
Mammals	Remote camera	Survey nights		2	
Broad-headed Snake/ Rosenberg's Goanna	Diurnal habitat searches	Person-hour	1		6
Amphibians	Nocturnal habitat search/dip net	Person-hours 1.5			5
FLORA					
Cryptostylis hunteriana/ Threatened flora	Random meander searches	Person-hours		1.5	3.5

Target Species/Guild	Sampling Technique	Units	2008	2009	2010
Additional Threatened Flora	Searches along access tracks	Person-hours		1.5	5

2.4 Weather Conditions

2.4.1 October 2008

Weather conditions during the three-day survey period were unseasonably cool and rainy with a temperature variance from 2.9°C to 6.9 °C (min) and 10.7°C to 11.9°C (max). There were intermittent showers throughout the survey period, which amounted to 7.2 mm of rain over the three days. Most of the rain fell in the early evening and through the night.

2.4.2 November 2009

Weather conditions during the three days preceding the survey were hot and dry, with a minimum temperature at the closest weather station (Bowral) of 15.9°C and maximum of 38°C, and 0.6 mm of rain. During the survey period temperatures were cooler with a temperatures ranging from 11°C to 12°C (min) and 14.9°C to 20°C (max). 4.6 mm of rain fell at Bowral on the second day of surveys.

2.4.3 September 2010

Weather conditions during the survey period were variable but overall fairly close to the long-term climatic average for Bowral in September. Daily temperatures during the survey period averaged 6.0 °C (minimum daily temperature, range 1.6 °C to 9.6 °C) to 15.0 °C (maximum daily temperature, range 10.9°C to 19.1°C). Average mean temperatures for the month of September in Bowral are 5.2°C minimum and 16.2°C maximum. Light rain was recorded: a total of 11.8 mm fell over four days throughout the survey period, with a maximum fall of 4.2 mm in one day. Several days were moderately windy with a maximum recorded wind speed of 22km/h recorded on the second day of September.

265,000 266,000

6,201,000 6,200,000

265,000 266,000

Legend

SurveyType

- *Cryptostylis hunteriana* search
- Disturbance colonising threatened flora search
- High Voltage Power Lines
- Development area
- Site Boundary

1:7,000 (at A3)

0 50 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

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Southern Highlands Regional Shooting Complex
Spring Surveys

Job Number	21-17850
Revision	A
Date	22 SEP 2010

Flora Spring Survey Effort

Figure B-1

G:\21\17850\GIS\Map_Documents\2117850_Z007_FloraSurveyeffort.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data Source: Navigate Streetmap: Streetmap - Jan 2010. Created by: qjchung

265,000

266,000

6,201,000

6,200,000

Legend

- KoalaSAT
- Anabat
- Harp Trap
- Spotlighting
- High Voltage Power Lines
- Frog search
- Call Playback
- Remote Camera
- Bird Surveys
- Development area
- Reptile search
- Bird Survey
- Site Boundary

1:7,000 (at A3)

0 50 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

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Southern Highlands Regional Shooting Complex
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Job Number	21-17850
Revision	A
Date	22 SEP 2010

Fauna Spring Survey Effort

Figure B-2

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3. Result s

A list of fauna species identified during the spring surveys across all three survey periods and those species recorded in the field surveys for the EA (GHD 2007, 2008) is presented in Table 4. A summary of the combined survey results is presented below.

3.1 Results of Targeted Surveys for Nominated Species

3.1.1 Forest Owls

One threatened owl species, the Barking Owl (*Ninox connivens*) responded to call playback in 2009 and 2010 surveys. On both occasions the owl was recorded to the north of the site, approximately 600-700m away from the call-playback site. This species was previously recorded in the study area during the field surveys for the Supplementary Ecological Assessment (GHD 2008).

Surveys in November 2009 tentatively recorded the Powerful Owl (*Ninox strenua),* however the individual was estimated to be at least 2km away and the call was too indistinct for definite identification to be made. The species was not recorded during the 2008 or 2010 surveys.

Neither the Sooty Owl nor the Masked Owl was recorded in any survey period.

3.1.2 Microbats

Bat activity for the survey periods was considered generally low, ranging from 1 – 12 calls per hour (assuming 12 hour survey period) with an average of less than three calls for each hour of survey (all sites and nights combined). Bat activity was rarely recorded beyond mid morning, with most activity occurring within the first 2 -3 hours of sunset.

Ten microchiropteran bat species were definitely recorded during the spring surveys, either captured in harp traps or through confident (definite) call identification (Table 4). None of these species are listed as threatened under the TSC Act or EPBC Act.

Three threatened bat species were tentatively recorded (Probable identification) as a result of call analysis: the Greater Broad-nosed Bat (*Scoteanax rueppellii)*, Eastern Falsistrelle (*Falsistrellus tasmaniensis)* and Little Bentwing Bat (*Miniopterus australis)*. All three species are listed as Vulnerable under the TSC Act.

Definite analysis was not possible for the Greater Broad-nosed Bat and Eastern Falsistrelle due to lack of clear diagnostic features and the high level of overlap in call characteristics with other species (*S.rueppellii/S. orion/ F. tasmaniensis*). Both species have been previously recorded within the locality and are considered likely to occur in the study area given the presence of suitable habitat.

The Little Bentwing Bat was also recorded as Probable from three sequence files containing multiple species calls recorded during the 2010 surveys. Each file contained 2-4 non-consecutive pulses which were 58 kHz or greater (other pulses in the file were less than 45 kHz) and clearly displayed the characteristic down sweeping tail. However other parts (e.g. from the knee above) were absent, the pulses were non-consecutive and were part of a multiple species file making positive identification not possible. This species has been previously recorded within the locality and is considered likely to occur in the study area given the presence of suitable habitat.

One additional threatened species, the Large-footed Myotis (*Myotis macropus*) was recorded as a possible identification from the 2008 spring surveys. Whilst a definite identification was not possible, this species is considered likely to occur in the study area on occasion given previous records from the locality.

In addition, the species group *Vepadelus* sp./*Miniopterus schreibersii oceanensis* was recorded as a possible identification in the 2010 Spring Surveys, and thus the Eastern Bentwing Bat (*M. schreibersii oceanensis*) may also occur in the Project area. This species has been previously recorded within the locality and is considered likely to occur in the study area given the presence of suitable habitat.

Of the threatened species tentatively recorded, the Little and Eastern Bent-wing Bats are predominantly cave-roosting species, the Greater Broad-nosed Bat and Eastern Falsistrelle roost in tree-hollows, and the Large-footed Myotis roosts in caves or tree-hollows near water (Churchill 2008). All five species are likely to forage throughout the study area and surrounding conservation lands and the latter three species may potentially roost within the proposed Project area. The remainder of the microbat species recorded during the spring surveys (see Table 4) are tree-roosting species and are likely to forage and potentially roost in the study area.

3.1.3 Koala

The Koala is known to occur in the locality and Koala scats and tracks were recorded in the study area during the Supplementary Ecological Assessment (GHD 2008).

No Koalas were observed during any of the three survey periods. The Grey Gum (*Eucalyptus punctata)* is the dominant Koala feed tree encountered within the study area. Several individuals of this species had scratch marks on the trunks and branches, but these marks could not be definitely attributed to the Koala and may have been made by possums, gliders, monitors or other animals. No Koala scats were located during spot assessments or opportunistic surveys of potential food trees in the Spring surveys.

3.1.4 Threatened Flora

Cryptostylis hunteriana

No observations of *C. hunteriana* or other orchids were recorded during the targeted field surveys undertaken on the site on the 23rd and 24th November 2009. As noted above, the survey was suspended after 2 days/2 nights due to legal considerations pending the outcome of a community action in the Land and Environment Court

Other Threatened Plant Species

No other threatened flora species were observed during targeted searches or opportunistically while conducting other surveys or traversing the site.

3.2 Results of Additional Surveys

3.2.1 Arboreal Mammals

Yellow-bellied Gliders, which were previously recorded at the site (GHD 2007, 2008), responded to call playback in the 2008 spring surveys. Sugar Gliders were observed during stagwatches and spotlight surveys in all survey periods.

No evidence of Squirrel Gliders was recorded despite call playback and spotlight surveys in areas of potentially suitable habitat during the 2008 and 2010 surveys.

3.2.2 Reptiles

No evidence of the Broad-headed Snake (*Hoplocephalus bungaroides*) was recorded despite active searches in areas of potentially suitable habitat and the presence of preferred prey species such as Lesueur's Velvet Gecko (*Oedura lesueurii*) and Copper-tailed Skink (*Ctenotus taeniolatus*). Six reptile species were recorded during these searches, including one gecko, one snake and three skink species not recorded in the study area during the previous surveys (see Table 4). Most individuals were found sheltering under rock fragments on sunny, exposed ledges while others were moving though leaf litter during the warmest part of the day.

Rosenberg's Goanna (*Varanus rosenbergii*) was not observed during surveys. A number of termite mounds showed signs of disturbance but in most cases this appeared to be as a result of Short-beaked Echidna (*Tachyglossus aculeatus*) foraging activity. GPS locations were taken of termite mounds with evidence of disturbance and these mounds should be inspected by the Contractor's Ecologists for possible nest sites of Rosenberg's Goanna during the Project pre-clearance surveys as outlined in the Ecological Management Plan.

3.2.3 Frogs

Neither the Giant Burrowing Frog nor the Red-crowned Toadlet were recorded at the site, and no evidence of any other threatened frog species was observed. Seven species of frog were recorded calling at ponds in the study area (see Table 4), none of which are listed as threatened under either state or federal legislation. Of these, the Spotted Grass Frog (*Limnodynastes tasmaniensis*) had not been recorded during the previous field surveys in the study area (GHD 2007, 2008). Others species had been previously recorded on site, including a burrowing frog (*Limnodynastes ornatus*), terrestrial species (*Uperoleia tyleri, Crinia signifera*) and tree frogs (*Litoria verreauxii, Litoria peroni*).

3.2.4 Birds

A total of 61 species of native birds were recorded during the spring surveys, including 27 species not previously recorded in the study area (see Table 4). Species recorded mostly comprised woodland and forest birds. Open country or generalist species such as the Australian Magpie (*Cracticus tibicen*), Galah (*Eolophus roseicapillus*) and Little Corella (*Cacatua sanguine*a) were mainly observed in the vicinity of the existing cleared rifle range or flying overhead. No exotic bird species were recorded.

Guilds and species observed included:

- Owls and nocturnal birds, such as the Southern Boobook (*Ninox connivens*), Australian Owlet-nightjar (*Aegotheles cristatus*) and Tawny Frogmouth (*Podargus strigoides*);
- Honeyeaters such as the Red Wattlebird (*Anthochaera carunculata*), Eastern Spinebill (*Acanthorhynchus tenuirostris*), Noisy Friarbird (*Philemon corniculatus*) and White-eared Honeyeater (*Lichenostomus leucotis*);
- A high diversity of small woodland and forest birds such as Thornbills (*Acanthiza* spp.), Pardalotes (*Pardalotus* spp.), Robins (Petroicidae spp.), Fantails (*Rhipidura* spp.) and Whistlers (*Pachycephala* spp.);

- Larger woodland birds including the Laughing Kookaburra (*Dacelo novaeguineae*), Pied Currawong (*Strepera graculina*) and Gang-gang Cockatoo (*Callocephalon fimbriatum*); and
- Open country or generalist species such as the Crested Pigeon (*Ocyphaps lophotes*), Galah (*Eolophus roseicapillus*) and Australian Magpie (*Cracticus tibicen*).

Two threatened species of diurnal birds were recorded during the 2010 survey period: the Scarlet Robin (*Petroica boodang*) and the Gang-gang Cockatoo (*Calyptorhynchus funereus*), both of which are listed as Vulnerable under the NSW TSC Act. The Gang-gang Cockatoo has not been previously recorded during field surveys in the study area, however potential habitat had previously been identified and the species was considered likely to occur (GHD 2008). A pair of birds was observed foraging in vegetation in the vicinity of the Project area and individuals were observed flying over the study area. The Scarlet Robin was recorded during the original field surveys (GHD 2006) but was not listed as a threatened species at the time of the ecological assessment. Individuals were observed on a number of occasions during the survey period foraging in native vegetation adjoining the existing range and in the proposed Project area.

3.2.5 Terrestrial Mammals

Swamp Wallaby scats and tracks were abundant throughout the site but individuals were sighted only infrequently during surveys. The Short-beaked Echidna was not directly observed but distinctive diggings and destroyed termite mounds were recorded, indicating they are also present at the site. Common wombats were active, with several individuals sighted and a moderate abundance of active and potential burrows observed. GPS locations were taken for active burrows and these should be inspected by the Contractor's Ecologists for possible installation of one-way wombat gates during the Project pre-clearance surveys as outlined in the Ecological Management Plan.

Two exotic mammal species were recorded during the spring surveys; Dogs (*Canis lupus familiaris*) were heard on most of the survey nights and scats of the European Fox (*Vulpes vulpes*) were recorded in the study area.

Table 4 Fauna species detected during field surveys in the Project study area

Family	Common Name	Scientific Name	TSC Status	EPBC Status	EA Surveys[†]	Spring Surveys		
					2006/2008	2008	2009	2010
FAUNA								
Frogs								
Hylidae	Jervis Bay Tree Frog	*Litoria jervisiensis*			X (tadpoles)			
	Peron's Tree Frog	*Litoria peroni*			X (tadpoles)			X
Ve	rreaux's Frog	*Litoria verreauxii*			X (call)			X
T	ree Frog	*Litoria* sp.					X	
Myobatrachidae	Eastern Common Froglet	*Crinia signifera*			X	X	X	X
F	letcher's Frog	*Lechriodus fletcheri*			X (poss)			
Eastern	Banjo Frog	*Limnodynastes dumerilii*			X	X		
	Ornate Burrowing Frog	*Limnodynastes ornatus*					X	
	Spotted Grass Frog	*Limnodynastes tasmaniensis*						X
T	yler's Toadlet	*Uperoleia tyleri*			X			X
Reptiles								
Agamidae Mounta	in Dragon	*Rankinia diemensis*			X			X
Elapidae	Red-bellied Black Snake	*Pseudechis porphyriacus*			X			
	Eastern Brown Snake	*Pseudonaja textilis*						X
Gekkonidae	Lesueur's Velvet Gecko	*Oedura lesueurii*						X

Family	Common Name	Scientific Name	TSC Status	EPBC Status	EA Surveys†	Spring Surveys	
Scincidae Red-thr	oated Skink	*Acritoscincus platynota*					X
Cop	per-tailed Skink	*Ctenotus taeniolatus*					X
	Eastern Water Skink	*Eulamprus quoyii*			X		
Dark-flecked	Garden Sunskink	*Lampropholis delicata*					X
Varanidae Lace	Monitor	*Varanus varius*			X		
Mammals (excl. bats)							
Acrobatidae F	eathertail Glider	*Acrobates pygmaues*			X		
Canidae Dog	*	*Canis lupus familiaris**			tr, sc		X
Fo	x *	*Vulpes vulpes**			tr, sc		X
Dasyuridae Antechi	nus sp.				sc		
Leporidae Europ	ean Rabbit*	*Oryctolagus cuniculus**			X		
Macropodidae Eastern	Grey Kangaroo	*Macropus giganteus*			sc		
Red-	necked Wallaby	*Macropus rufogriseus*			X		
S	wamp Wallaby	*Wallabia bicolor*			X	X	X
Muridae Rat		*Rattus* sp.			X		
Phascolarctidae Koal	a	*Phascolarctus cinereus*			tr, sc		
Petauridae Yell	ow-bellied Glider	*Petaurus australis*	V		X	X	
Sugar	Glider	*Petaurus breviceps*			X	X	X
Phalangeridae	Common Brushtail Possum	*Trichosurus vulpecula*			X		

Family	Common Name	Scientific Name	TSC Status	EPBC Status	EA Surveys†	Spring Surveys		
Tachyglossidae	Short-beaked Echidna	*Tachyglossus aculeatus*			tr			Diggings
Vombatidae	Common Wombat	*Vombatus ursinus*			X	X	X	X
Microbats								
Miniopteridae	Little Bentwing Bat	*Miniopterus australis*	V					Pr
Molossidae	White-striped Freetail-bat	*Tadarida australis*			X	D		
	Eastern Freetail Bat	*Mormopterus sp. 2 (ridei)*						D
Rhinolopidae	Eastern Horseshoe-bat	*Rhinolophus megaphyllus*					D	Ha
Vespertilionidae	Gould's Wattled Bat	*Chalinolobus gouldii*				Pr	Ha	D
	Chocolate Wattled Bat	*Chalinolobus morio*				Pr	Pr	D
Eastern	Falsistrelle	*Falsistrellus tasmaniensis*	V					Pr
	Gould's Long-eared Bat	*Nyctophilus gouldii*					Ha	D
	Greater Long-eared Bat	*Nyctophilus* sp.			X	D	*	
	Greater Broad-nosed Bat	*Scoteanax rueppellii*	V					Pr
	Eastern Broad-nosed Bat	*Scotorepens orion*						Ha
	Large Forest bat	*Vespadelus darlingtoni*				D	Ha	Ha
	Eastern Forest Bat	*Vespadelus pumilus*					Po	-
	Southern Forest bat	*Vespadelus regulus*					Ha	-
	Little Forest bat	*Vespadelus vulturnus*					Ha	Ha
	Chocolate Wattled Bat/Little Forest Bat **	*C. morio/V. vulturnus*					X	X

Family	Common Name	Scientific Name	TSC Status	EPBC Status	EA Surveys†	Spring Surveys	
Mixed Calls **	*Mormopterus* Sp.2/Gould's Wattled Bat **	*M. sp 2/ C. gouldii* **				X	X
Greater	Broad-nosed Bat/Eastern Falsistrelle **	*S. rueppellii*/*S. orion*/*F. tasmaniensis* **					X
	Forest Bat sp./Eastern Bentwing Bat	*Vespadelus* sp./*Miniopterus schreibersii oceanensis* (TS) **	V (*M. schrebersii oceanensis*)				X
Souther	n Myotis/Long-eared Bat sp. **	*Myotis macropus/Nyctophilus* sp.**	V (*M. macropus*)			Po	
	Eastern Broad-nosed Bat /Eastern Falsistrelle **	*Scotorepens orion*/*Falsistrellus tasmaniensis* **	V (*F. tasmaniensis*)			Po	X
Birds							
Anatidae	Australian Wood Duck	*Chenonetta jubata*			X		
	Pacific Black Duck	*Anas superciliosa*			X		
Chestn	ut Teal	*Anas castanea*			X		
Acanthizidae Striated	Thornbill	*Acanthiza lineata*			X		X
Yell	ow Thornbill	*Acanthiza nana*			X		X
Bro	wn Thornbill	*Acanthiza pusilla*			X	X	X
Buff-rumped	Thornbill	*Acanthiza reguloides*					X
Bro	wn Thornbill	*Acanthiza pusilla*					X
Buff-rumped	Thornbill	*Acanthiza reguloides*					X

Family	Common Name	Scientific Name	TSC Status	EPBC Status	EA Surveys†	Spring Surveys	
W	hite-throated Gerygone	*Gerygone albogularis*					X
W	hite-browed Scrubwren	*Sericornis frontalis*					X
Accipitridae Black-sh	ouldered Kite	*Elanus axillaris*			X		
Aegothelidae Australi	an Owlet-nightjar	*Aegotheles cristatus*					X
Alcedinidae Lau	ghing Kookaburra	*Dacelo novaeguineae*					X
Ardeidae	Cattle Egret	*Ardea ibis*			X		
Artamidae Pied	Butcherbird	*Cracticus nigrogularis*					X
Grey	Butcherbird	*Cracticus torquatus*			X		X
Australian	Magpie	*Cracticus tibicen*			X		X
Pied	Currawong	*Strepera graculina*			X		X
Grey	Currawong	*Strepera versicolor*			X		
Cacatuidae Sulp	hur-crested Cockatoo	*Cacatua galerita*			X		X
Little	Corella	*Cacatua sanguinea*					X
Gang-g	ang Cockatoo	*Callocephalon fimbriatum*	V				X
Yell	ow-tailed Black-Cockatoo	*Calyptorhynchus funereus*			X	X	
Galah		*Eolophus roseicapillus*			X		X
Camphephegidae Black-face	d Cuckoo-shrike	*Coracina novaehollandiae*			X		X
Charadriidae Masked	Lapwing	*Vanellus miles*			X	X	
Cinclosomatidae Spotted	Quail-thrush	*Cinclosoma punctatum*			X		

Family	Common Name	Scientific Name	TSC Status	EPBC Status	EA Surveys[†]	Spring Surveys	
Climacteridae	White-throated Treecreeper	*Cormobates leucophaea*			X	X	X
Columbidae	Bar-shouldered Dove	*Geopelia humeralis*					X
	Peaceful Dove	*Geopelia striata*					X
	Crested Pigeon	*Ocyphaps lophotes*					X
	Common Bronzewing Pigeon	*Phaps chalcoptera*			X		
	Brush Bronzewing	*Phaps elegans*				X	
Corvidae	Australian Raven	*Corvus coronoides*			X		X
Cuculidae	Fan-tailed Cuckoo	*Cacomantis flabelliformis*			X		X
	Shining Bronze-cuckoo	*Chalcites lucidus*					X
	Pallid Cuckoo	*Cuculus pallidus*			X		
	Eastern Koel	*Eudynamys orientalis*				X	
Dicaeidae	Mistletoe bird	*Dicaeum hirundinaceum*			X		
Dicruridae	Magpie-lark	*Grallina cyanoleuca*			X		
	Grey Fantail	*Rhipidura fuliginosa*			X		
	Willie Wagtail	*Rhipidura leucophrys*			X		
Halcyonidae	Laughing Kookaburra	*Dacelo novaeguineae*			X		
Hirundinidae	Welcome Swallow	*Hirundo neoxena*			X		
Loriidae	Rainbow Lorikeet	*Trichoglossus haematodus*			X		
	Scaly-breasted Lorikeet	*Trichoglossus*			X		

Family	Common Name	Scientific Name	TSC Status	EPBC Status	EA Surveys†	Spring Surveys	
		chlorolepidotus					
Maluridae Super	b Fairy-wren	*Malurus cyaneus*			X		
Varie	gated Fairy-wren	*Malurus lamberti*				X	X
Meliphagidae Eastern	Spinebill	*Acanthorhynchus tenuirostris*			X		X
Red	Wattlebird	*Anthochaera carunculata*			X	X	X
Little	Wattlebird	*Anthochaera chrysoptera*			X		X
Yell	ow-faced Honeyeater	*Lichenostomus chrysops*			X		X
W	hite-eared Honeyeater	*Lichenostomus leucotis*				X	X
Nois	y Miner	*Manorina melanocephala*			X		
Le	win's Honeyeater	*Meliphaga lewinii*			X		X
Bro	wn-headed Honeyeater	*Melithreptus brevirostris*					X
W	hite-naped Honeyeater	*Melithreptus lunatus*					X
Scarlet	Honeyeater	*Myzomela sanguinolenta*					X
Nois	y Friarbird	*Philemon corniculatus*			X	X	
	New Holland Honeyeater	*Phylidonyris novaehollandiae*			X		
W	hite-checked Honeyeater	*Phylidonyris nigra*			X		
Menuridae Super	b Lyrebird	*Menura novaehollandiae*			X		X
Nectariniidae Mistletoe	bird	*Dicaeum hirundinaceum*					X
Orthonychidae Eastern	Whipbird	*Psophodes olivaceus*			X		

Family	Common Name	Scientific Name	TSC Status	EPBC Status	EA Surveys[†]	Spring Surveys		
Pachycephalidae	Gre y Shrike-thrush	*Colluricincla harmonica*			X		X	X
	Golden Whistler	*Pachycephala pectoralis*			X			X
	Rufous Whistler	*Pachycephala rufiventris*					X	X
Pardalotidae	Spotted Pardalote	*Pardalotus punctatus*			X			X
	Striated Pardalote	*Pardalotus striatus*						X
	W hite-browed Scrubwren	*Sericornis frontalis*			X			
	Red- browed Finch	*Emblema temporalis*			X			
Petroicidae	Eastern Yellow Robin	*Eopsaltria australis*			X			X
	Scarlet Robin	*Petroica boodang*	V		X			X
	Rose Robin	*Petroica rosea*						X
Podargidae	T awny Frogmouth	*Podargus strigoides*			X		X	X
Podicipedidae	Australas ian Grebe	*Tacybaptus novaehollandiae*			X			
Psittacidae	Australian King Parrot	*Alisterus scapularis*			X			
	Crimson Rosella	*Platycercus elegans*			X		X	X
	Eastern Rosella	*Platycercus eximius*			X		X	
Rhipiduridae	Gre y Fantail	*Rhipidura albiscapa*					X	X
	Rufous Fantail	*Rhipidura rufifrons*	M					X
Strigidae	Barkin g Owl	*Ninox connivens*	V		X		X call	X call
	Souther n Boobook	*Ninox novaeseelandiae*			X	X	X	X

Family	Common Name	Scientific Name	TSC Status	EPBC Status	EA Surveys†	Spring Surveys	
Po	werful Owl	*Ninox strenua*	V			Possible	
Sturnidae Starlin	g *	*Sturnus vulgaris* *			X		
Common	Myna *	*Acridotheres tristis* *			X		
Timaliidae Silvere	ye	*Zosterops lateralis*			X		X

Codes used

† – EA Surveys: records include opportunistic records from vicinity of study area

V – listed as Vulnerable under the TSC/EPBC Act

M – listed as Migratory under the EPBC Act

X – Directly observed (heard/seen)

Tr – tracks

Sc - scats

* - introduced species

:

Ha – caught in Harp trap

D – definite Anabat recording

Pr – probable Anabat recording

Po – possible Anabat recording

** = not possible to confidently distinguish the call as belonging to one species or the other

4. Discussion

4.1 Threatened Fauna

4.1.1 Records and Consideration of Likelihood of Occurrence

The supplementary spring surveys provided the following results with respect to nominated targeted threatened fauna species:

- Definite records in the study area for the Barking Owl, Gang-gang Cockatoo and Scarlet Robin;
- Probable records of the Greater Broad-nosed Bat, Eastern Falsistrelle and Little Bentwing Bat;
- Possible records of the Large-footed Myotis and Powerful Owl;
- No observations or definite evidence (e.g. scats) of the Koala.

Of these, the Koala, Barking Owl and Scarlet Robin had been previously recorded in the study area during the field surveys for the original and supplementary ecological assessment reports (GHD 2007, 2008).

All of these species (except the Scarlet Robin) were identified in the Supplementary Ecological Assessment (GHD 2008) as threatened species that could potentially occur on site and it is considered likely that all species listed above occur in the study area at least on occasion. The Scarlet Robin has previously been recorded at the site (GHD 2008), but was not listed as Vulnerable under the NSW TSC Act until February 2010 and hence was not assessed as such in the Supplementary Ecological Assessment.

4.1.2 Assessment of Likelihood of Impacts on Threatened Fauna

Assessments of Significance under the relevant legislation were undertaken in the Supplementary Ecological Assessment Report (GHD 2008) for threatened species recorded or which could potentially occur to determine the likely impacts of development, based on the assumption that these species would occur in the study area at least on occasion (GHD 2008). The outcome of these assessments was that the Project was unlikely to have a significant impact on any of these fauna species or their habitat, given that:

- The 16ha of habitat to be removed represents approximately 1% of potential habitat for these species within the site, and a much smaller proportion of such habitat within the locality;
- The development is unlikely to isolate or significantly fragment habitat for any of these mobile fauna species, which may readily traverse cleared areas created by this activity;
- The Project will result in the conservation of habitats in the remainder of the excised area and the Bargo SCA which would consolidate habitat for these species in the locality and better conserve linkages such as the Bargo Linkage between the Nattai and Woronora plateaux;
- Construction and Operation of the Facility will be undertaken in accordance with an Ecological Management Plan incorporating specific mitigation measures and environmental management measures to avoid or minimise potential adverse impacts on threatened species and their habitats known or considered likely to occur in the study area. Supplementary targeted spring surveys would be undertaken for native fauna, including the Koala, microbats and forest owls in accordance with the

Conditions of Consent for the Project to detect additional species presence and confirm appropriate management procedures are incorporated in the EMP.

The full Assessments of Significance for each species can be found in the Supplementary Ecological Impact Assessment (GHD 2008).

An Ecological Management Plan (EMP) (GHD 2010a) has been prepared for the Project study area that incorporates specific mitigation and environmental management measures to ensure that impacts on individuals of the above threatened species and other species which may potentially occur at the site will be minimised as far as possible during both the construction and operational phases of the development. The results of the Spring surveys have been used to review and confirm appropriate management measures are contained within the EMP for the Project study area.

Management measures of particular relevance to threatened fauna species discussed above and other native fauna during the three key stages of the Project include but are not limited to:

Pre-construction Phase

- The clear demarcation of the construction footprint to avoid unnecessary loss or disturbance of surrounding habitat during construction activities and to clearly define the area for pre-clearing surveys;
- Pre-clearing surveys undertaken by an appropriately qualified ecologist(s) employed by the contractor to identify and mark:
  - habitat features (e.g. hollow-bearing trees, hollow logs and rock outcrops, active wombat burrows, and disturbed termite mounds) for inspection and for particular management during vegetation clearing activities to avoid or minimise the potential for harm to or mortality of resident fauna;
  - habitat features suitable for relocation in adjoining secure habitats;
  - hollow-bearing trees and/or Yellow-belled Glider feed trees to be retained in the vicinity of the proposed car park or along access roads, where possible; and
- The induction of site workers with respect to relevant Fauna Management Procedures to be implemented during the pre-construction and construction phases of the development.

Construction Phase

Implementation of specific fauna management procedures to avoid or minimise the potential for harm or mortality of fauna species during construction phase of the development:

- Habitat Clearing and Hollow Tree Removal Management Procedure;
- Native Fauna Management Procedure;
- Fauna Handling Management Procedure; and
- Habitat Reinstatement Management Procedure.

Clearing of vegetation and fauna habitat will be undertaken in accordance with these management procedures and will involve in summary:

- Leaving hollow-bearing trees identified during the pre-clearing surveys or those occupied by a Koala to a second stage of clearing to increase the possibility of resident fauna/Koalas relocating of their own volition prior to removing the trees;

- Inspection of habitat features identified during the pre-clearing surveys immediately prior to clearing and careful removal techniques to minimise the potential for injury or mortality of resident fauna;
- Ensuring an experienced wildlife specialist(s) is present to manage and retrieve/relocate any displaced wildlife during clearing activities;
- Relocating displaced fauna to suitable secure habitat in adjoining areas, organising for their appropriate care and treatment if required;
- Reinstatement of fauna habitat features removed from the construction footprint in adjoining secure habitat;
- A wildlife specialist(s) (with recognised skills in animal care and handling) must be engaged by the contractor to be present during all vegetation clearing activities and on call during subsequent construction activities. The wildlife specialist(s) will be responsible for the welfare of all animals encountered during the construction phase of the project, particularly animals sheltering in vegetation or habitat features which are to be cleared. Where necessary, assistance from a Veterinarian may also be required where distressed/injured animals are concerned, or where feral mammals are captured; and
- The contractor's ecologist will be required to advise on the reinstatement of transportable habitat features in surrounding vegetation during the vegetation clearing.

Operational Phase

Implementation of impact mitigation and environmental management measures to minimise the potential for indirect off-site impacts on fauna and their habitats, including:

- Lights to be located and directed so as to avoid as far as possible light spill into surrounding habitats;
- Weed and pest control undertaken in the Plan area in collaboration with the National Parks and Wildlife Group as part of the agreed annual works program, as outlined in the draft Memorandum of Understanding between the Group and Communities NSW. Weed control will also be undertaken in the SP1 zone by professional bush regenerators in accordance with the Weed Management Strategy and the Conservation Agreement (2010);
- Access to surrounding bushland restricted to existing bushwalking tracks, which should be clearly posted;
- Closure of unused/unwanted tracks through surrounding bushland and rehabilitate, using natural regeneration where possible; and
- Implementation of Fauna Management and Fauna Handling Procedures with respect to operational activities.

A detailed discussion of all impact mitigation and environmental management measures proposed is contained in the EMP (GHD 2010a).

Given the limited habitat removal and habitat modification proposed, the conservation of surrounding areas of known and potential habitat and maintenance of habitat connectivity and the implementation of specific impact mitigation and environmental management measures to protect fauna and their habitats it is concluded that the Project is unlikely to impose a significant effect on threatened fauna species or habitats of relevance to the study area.

4.2 *Cryptostylis hunteriana*

4.2.1 Considerations Regarding Likelihood of Occurrence

The Supplementary Ecological Assessment report (GHD 2008) prepared for the Part 3A Environmental Assessment of the Project took a conservative approach when assessing the potential for impacts on *Cryptostylis hunteriana* based on the identification of potential habitat for the species using the EPBC Act Protected Matters Search Tool.

The Protected Matters Search tool generates a report that will help determine whether matters of national environmental significance or other matters protected by the EPBC Act are likely to occur in the area of interest. Any information provided through this facility is indicative only (DEWHA 2010a). For species where the distributions are well known, maps have been digitised from sources such as recovery plans and detailed habitat studies. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated; and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge (DEWHA 2008). Outputs from a protected matters search include the following in order of likelihood of occurrence:

- Species or species habitat may occur within area;
- Species or species habitat likely to occur within area.

The protected matters search identified that *Cryptostylis hunteriana* or its habitat may occur within the 10km buffer identified around the Hill Top site. It is noted in the caveat of the protected matters report that the "report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms" (DEWHA 2010b).

There are no records of *C. hunteriana* occurring within a 10km radius of the Hill Top site on the DECCW Wildlife Atlas with only 1 record for the species in the LGA. Furthermore, the species is not known to occur in the surrounding Bargo SCA and Nattai National Park (NPWS 2001, DEC 2004). An updated search of the DECCW wildlife atlas undertaken on 17th August 2010 also revealed no new records for the species with 10km of the site. The nearest record to the study area is at Fitzroy Falls, over 25km to the south. Most records of this species in NSW occur in coastal areas (see below).

Cryptostylis hunteriana occurs from Victoria to Queensland. In NSW, it is recorded mainly on coastal and near coastal ranges north to Forster (DEWHA 2008, Bishop 2000, Riley and Banks, 2002). It appears to be most common in the Shoalhaven area (Clarke et al. 2004). *C. hunteriana* is considered to be rare and naturally fragmented within its range (DEWHA 2010c).

According to the DECCW profile, *C. hunteriana* does not appear to have well defined habitat preferences in NSW and is known from a range of communities (DECCW 2005a). The species occurs mostly in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland and lowland forest. Soils include moist sands and moist to dry clay loam. It has also been recorded growing in accumulated eucalyptus leaves (Jones 2006). Jones (1993) suggests that this species grows most often on the flat plains close to the coast, favouring moist soils.

On the basis of known distribution, habitat preferences and absence of known records within the locality of the site it could be considered that *C. hunteriana* is unlikely to occur on the subject site. As noted above, targeted surveys for this species during November 2009 during the species identified flowering period (November to December) did not detect any specimens on site. However, the vegetation that is

present on the subject site falls into a very broad vegetation type (Sydney Hinterland Dry Sclerophyll Forest) that *C. hunteriana* has been recorded in at other sites within its known distribution and on this basis could theoretically occur.

4.2.2 Assessment of Likelihood of Impacts on *Cryptostylis hunteriana*

In assessing the potential for the proposed Project to have a significant impact on this species the following points have been considered:

- *C. hunteriana* theoretically has the potential to occur at the site, although it has not been previously recorded within the locality, including in surrounding conservation reserves, nor during recent targeted surveys on the site in November 2009;
- The area of potential habitat for this species that will be lost or modified as a result of the proposal (16 ha) represents only a small portion of potential habitat for this species in the surrounding area, including within the remainder of the 1036 ha area excised from Bargo SCA and extensive tracts of native vegetation in the surrounding conservation reserves;
- There is a low likelihood of adverse impacts on any threatened plants if present in areas surrounding the proposed development footprints. The Ecological Management Plan prepared for the site contains specific impact mitigation and environmental management measures that are to be incorporated into the CEMP and OEMP for the site to minimise the potential for adverse impacts on retained native vegetation, including areas of potential habitat for *C. hunteriana*.

  Management measures of particular relevance include but are not limited to:

  - Implementation of a weed management strategy to minimise the potential for the introduction of invasive weeds into vegetation surrounding the site;
  - Implementation of the Soil and Water Management Plan including measures to control erosion and sediment discharge;
  - Development of a program to test for the presence of *Phytophthora cinnamomi* and hygiene measures to be implemented during the construction and operational phases of the development to prevent the pathogens introduction or spread on site;
  - Preparation of operational guidelines to assist personnel undertaking site maintenance works in identification of the species and prevention of habitat destruction or degradation; and
  - Restriction of vehicular and pedestrian access through the 'conservation area' of the site.

On the basis of these and other considerations it is concluded in accordance with the assessment of significance (7-part test) and EPBC Act Assessment of significance for *C. hunteriana* prepared for the Environmental Assessment (GHD 2008) that the Project is unlikely to impose a significant impact on *C. hunteriana* should it occur within the Project area.

4.3 Other Threatened Plants that may Potentially Occur

Additional targeted surveys for *Acacia bynoeana*, *Persoonia acerosa*, *P. hirsuta*, *P. bargoensis*, *P. glaucescens* and *Grevillea parviflora* subsp. *parviflora* undertaken in known flowering periods and focussing on areas of potentially suitable habitat have not detected any individuals of these species in the Project study area, including in particular in areas to be directly affected by construction and access track maintenance activities.

There is a low likelihood of adverse impacts on threatened plants if present in areas surrounding the proposed development footprints given the proposed implementation of environmental management and mitigation measures to minimise potential impacts as detailed in the management plans for the site (ie Ecological Management Plan, Soil and Water Management Plan, CEMP and OEMP [GHD 2010a, 2010b, 2010c]).

Management measures of particular relevance for the protection of native vegetation and threatened plant species and their habitats that may potentially occur on site include but are not limited to:

- Procedures for the rapid stabilisation of disturbed soil surfaces during construction and the appropriate management of stormwater during the construction and operational stages of the development;
- Implementation of appropriate erosion and sediment control features;
- Development and implementation of a *Phytophthora cinnamomi* control and monitoring program;
- Threatened flora identification and management procedures for works along access/tracks and fire trails;
- Restriction of vehicle and pedestrian access through the site;
- Implementation of a weed management strategy; and
- Use of naturally occurring native species in rehabilitation and landscaping works and non-invasive turf on range areas.

It is considered unlikely that the Project will impose a significant impact on these species given:

- The absence of evidence for these threatened species within the proposed disturbance areas;
- The extent of similar suitable habitat within the conservation area of the site and surrounding reserves; and
- The impact mitigation measures and environmental management measures to be implemented to identify and manage specimens if they are detected and to protect areas of potential habitat on site.

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Appendix G

Suggested Species List for Rehabilitation

The following table lists selected species found in GHD surveys on site which are judged to be suitable for revegetation and landscaping purposes. This list is not exhaustive, and any native plant species which is to be cleared from the construction zone may be used. Conversely, not all species listed here may be judged suitable for revegetation purposes.

Several eucalypt species from this list have known value as feed trees for Koalas and/or Yellow-bellied Gliders. *Corymbia gummifera*, *Eucalyptus piperita*, *E. punctata* and *E. racemosa* are all identified sap feed trees for Yellow-bellied Gliders. *E. consideriana* and *E. punctata* are identified secondary feed trees for Koalas, and *E. globoidea* and *E. agglomerata* are identified supplementary feed trees for this species. These tree species or other known Koala and Yellow-bellied Glider feed trees native to the local area should be used in landscaped areas to provide habitat for these threatened fauna species.

Family	Botanical Name	Common Name
APIACEAE	*Xanthosia pilosa*	Woolly Xanthosia
	Xanthosia tridentata	
ASTERACEAE	*Actinotis minor*	Lesser Flannel Flower
CASUARINACEAE	*Allocasuarina littoralis*	Forest Oak
CUNONIACEAE	*Callicoma serratifolia*	Black Wattle
DILLENIACEAE	*Hibbertia riparia*	
	Hibbertia empetrifolia	
	Hibbertia scandens	Climbing Guinea Flower
	Eleocarpus reticulatus	Blueberry Ash
EPACRIDACEAE	*Epacris pulchella*	
	Leucopogon ericoides	
	Leucopogon lancelolatus	Lance Bearded Heath
	Lissanthe strogosa subsp. *subulata*	
EUPHORBIACEAE	*Amperea xiphoclada*	Broom Spurge
	Poranthera microphylla	
FABACEAE	*Bossiaea obcordata*	Spiny Bossiaea
	Daviesia corymbosa	
	Daviesia ulicifolia	
	Dillwynia retorta	Eggs and Bacon
	Dilwynia sp. "trichiphoda"	
	Gompholbium grandiflorum	

Family	Botanical Name	Common Name
	Gompholobium glabratum	
	Gompholobium latifolium	
	Hardenbergia violacea	Purple Coral-pea
	Hovea longifolia	
	Mirbelia rubiifolia	Heathy Mirbelia
	Pultenaea hispidula	
	Pultenaea linophylla	
	Pultenaea palacea	
	Pultenaea scabra	Rough Bush-pea
	Acacia elata	
	Acacia linifolia	
FABACEAE-MIMOSOIDEAE	*Acacia myrtifolia*	
	Acacia suaveolens	
	Acacia terminalis subsp. *angustifolia*	Flax Wattle
	Acacia ulicifolia	Prickly Moses
GOODENIACEAE	*Dampiera purpurea*	
	Goodenia bellidifolia	
	Goodenia hederacea var. *hederacea*	
	Scaevola ramosissima	Purple Fan Flower
LOMANDRACEAE	*Lomandra filiformis*	Wattle Mat-rush
	Lomandra longifolia	Spiny-headed Mat-rush
LOMANDRACEAE	*Lomandra multiflora*	
	Lomandra obliqua	Fish Bones
MYRTACEAE	*Baeckea linifolia*	Weeping Baeckea
	Corymbia gummifera	Red Bloodwood
	Eucalyptus agglomerata	Blue-leaved Stringybark
	Eucalyptus consideriana	Yertchuk
	Eucalyptus globoidea	White Stringybark
	Eucalyptus piperita	Sydney Peppermint

Family	Botanical Name	Common Name
	Eucalyptus punctata	Grey Gum
	Eucalyptus racemosa	Hard-leaved Scribbly Gum
	Eucalyptus sieberi	Mountain Ash
	Kunzea ambigua	Tick Bush
	Leptospermum anarchoides	
	Leptospermum polygalifoilum	Lemon-scented Tea-tree
	Leptospermum trinervium	
PHORMIACEAE	*Dianella caerulea var producta*	Blue Flax-lily
PITTOSPORACEAE	*Billardiera scandens*	Hairy Apple Berry
POACEAE	*Austrodanthonia* sp.	A Wallaby Grass
	Austrostipa pubescens	
	Entolasia marginata	
	Entolasia stricta	Right-angle Grass
	Oplismenus aemulus	Basket Grass
PROTEACEAE	*Banksia serrata*	Old Man Banksia
	Banksia spinulosa var. *spinulosa*	
	Conosperma longifolium	Long-leaf Smoke Bush
	Grevillea arenearia subsp. *srenaria*	
	Grevillea sphaceolata	Grey Spider Flower
PROTEACEAE	*Hakea dactyloides*	
	Hakea sericea	
	Isopogon anemonifoilus	
	Lambertia formosa	Mountain Devil
	Lomatia fraseri X L. siliafolia (hybrid)	
	Lomatia silaifolia	Crinkle Bush
	Petrophile pulchella	
	Telopea speciosissima	Waratah
RHAMMNACEAE	*Cryptandra amara*	Bitter Cryptandra
	Pomaderris ferrunginea	

Family	Botanical Name	Common Name
	Pomaderris lanigera	Wooly Pomaderris
RUBIACEAE	*Pomax umbellata*	
RUTACEAE	*Boronia ledifolia*	Showy Bornoia
SAPINDACEAE	*Dodonaea triquetra*	Large-leaf Hop Bush
SMILACACEAE	*Smilax australis*	Lawyer Vine
	Smilax glyciphylla	Sweet Sarsparilla
STYLIDIACEAE	*Stylidium graminifolium*	Grass Trigger-plant
	Stylidium laricifolium	Giant Trigger-plant
	Stylidium lineare	Narrow-leaved Trigger-plant
THYMELEACEAE	*Pimelea linifolia*	Slender Rice Flower
VIOLACEAE	*Hybanthus vernonii*	
XANTHORRHOECEAE	*Xanthorrhoea media*	Grass Tree
ZINGIBERACEAE	*Patersonia glabrata*	

Appendix H

Flora Recorded in Study Area

Family	Scientific Name	Common Name
FLORA		
APIACEAE	*Platysace ericioides*	
	Platysace lanceolata	
	Xanthosia pilosa	Woolly Xanthosia
	Xanthosia tridentata	
ASPLENIACEAE	*Asplenium flabellifolium*	Necklace Fern
ASTERACEAE	*Actinotis minor*	Lesser Flannel Flower
CASUARINACEAE	*Allocasuarina littoralis*	Forest Oak
CONVOLVULACEAE	*Cuscuta* sp.	Dodder
CUNONIACEAE	*Callicoma serratifolia*	Black Wattle
CYPERACEAE	*Cyathochaeta diandra*	
	Eleocharis sphaceolata	
	Juncus prizmatocarpus	
	Lepidosperma concavuum	
	Lepidosperma sp	
	Schoenus melanostachyos	
DENNSTAEDTIACEAE	*Pteridium esculentum*	Bracken Fern
DILLENIACEAE	*Hibberita riparia*	
	Hibbertia empetrifolia	
	Hibbertia scandens	Climbing Guinea Flower
ELEOCARPACEAE	*Tetratheca thymifolia*	Thyme Pink-bells
	Eleocarpus reticulatus	Blueberry Ash
ERICACEAE	*Epacris pulchella*	
	Leucopogon ericoides	
	Leucopogon lancelolatus	Lance Bearded Heath
	Lissanthe strogosa subsp. *subulata*	
EUPHORBIACEAE	*Amperea xiphoclada*	Broom Spurge
	Phyllanthus hirtellus	
	Phyllanthus hirsuta	
	Poranthera microphylla	
FABACEAE - FABOIDEAE	*Bossaiea probably neo-anglica*	

Family	Scientific Name	Common Name
	Bossiaea obcordata	Spiny Bossiaea
	Daviesia corymbosa	
	Daviesia ulicifolia	
	Dillwynia retorta	Eggs and Bacon
	Dilwynia sp. *"trichiphoda"*	
	Gompholbium grandiflorum	
	Gompholobium glabratum	
	Gompholobium latifolium	
	Hardenbergia violacea	Purple Coral-pea
	Hovea longifolia	
	Mirbelia rubiifolia	Heathy Mirbelia
	Pultenaea hispidula	
	Pultenaea linophylla	
	Pultenaea palacea	
	Pultenaea scabra	Rough Bush-pea
	Acacia elata	
	Acacia linifolia	
FABACEAE-MIMOSOIDEAE	*Acacia myrtifolia*	
	Acacia sp	
	Acacia sp probably obtusifolia	
	Acacia suaveolens	
	Acacia terminalis ssp. *angustifolia*	Flax Wattle
	Acacia ulicifolia	Prickly Moses
GOODENIACEAE	*Dampiera purpurea*	
	Goodenia bellidifolia	
	Goodenia hederacea var. *hederacea*	
	Scaevola ramosissima	Purple Fan Flower
HALOGORACEAE	*Gonocarpus tetragynus*	
	Gonocarpus teucrioides	Rasp Wort
LINDSAEAEACEAE	*Lindsaea microphylla*	Lacey Wedge Fern
LOMANDRACEAE	*Lomandra filiformis*	Wattle Mat-rush

Family	Scientific Name	Common Name
	Lomandra longifolia	Spiny-headed Mat-rush
LOMANDRACEAE	*Lomandra multiflora*	
	Lomandra obliqua	Fish Bones
	Lomandra sp.	
MYRTACEAE	*Baeckea linifolia*	Weeping Baeckea
	Corymbia gummifera	Red Bloodwood
	Eucalyptus agglomerata	Blue-leaved Stringybark
	Eucalyptus consideriana	Yertchuk
	Eucalyptus globoidea	White Stringybark
	Eucalyptus piperita	Sydney Peppermint
	Eucalyptus punctata	Grey Gum
	Eucalyptus racemos (previously sclerohpylla)	Hard-leaved Scribbly Gum
	Eucalyptus sieberi	Mountain Ash
	Kunzea ambigua	Tick Bush
	Leptospermum anarchoides	
	Leptospermum polygalifoilum	Lemon-scented Tea-tree
	Leptospermum trinervium	
ORCHIDACEAE	*Corybas* sp.	Helmet Orchid
PHORMIACEAE	*Dianella caerulea var producta*	Blue Flax-lily
PICRODENDACEAE	*Micrantheum ericoides*	
PITTOSPORACEAE	*Billardiera scandens*	Hairy Apple Berry
POACEAE	*Austrodanthonia* sp.	A Wallaby Grass
	Austrostipa pubescens	
	Cynodon dactylon	Common Couch
	Entolasia marginata	
	Entolasia stricta	Right-angle Grass
	Oplismenus aemulus	Basket Grass
PROTEACEAE	*Banksia serrata*	Old Man Banksia
	Banksia spinulosa var. *spinulosa*	
	Conosperma longifolium	Long-leaf Smoke Bush
	Grevillea arenearia subsp. *srenaria*	

Family	Scientific Name	Common Name
	Grevillea sphaceolata	Grey Spider Flower
PROTEACEAE	*Hakea dactyloides*	
	Hakea sericea	
	Isopogon anemonifoilus	
	Lambertia formosa	Mountain Devil
	Lomatia fraseri / siliafolia hybrid	
	Lomatia silaifolia	Crinkle Bush
	Persoonia laurina	
	Persoonia levis	
	Persoonia linearis	Narrow-leaf Geebung
	Persoonia mollis	
	Petrophile pulchella	
	Telopea speciosissima	Waratah
RESTIONACEAE	*Lepyrodia scariosa*	
RHAMMNACEAE	*Cryptandra amara*	Bitter Cryptandra
	Pomaderris ferrunginea	
	Pomaderris lanigera	Wooly Pomaderris
RUBIACEAE	*Galium propinqum*	Maori Bedstraw
RUBIACEAE	*Pomax umbellata*	
RUTACEAE	*Boronia ledifolia*	Showy Bornoia
	Eriostemon australasius	Pink Wax-flower
SAPINDACEAE	*Dodonaea triquetra*	Large-leaf Hop Bush
SMILACACEAE	*Smilax australis*	Lawyer Vine
	Smilax glyciphylla	Sweet Sarsparilla
STYLIDIACEAE	*Stylidium* sp.	
THYMELEACEAE	*Pimelea linifolia*	Slender Rice Flower
VIOLACEAE	*Hybanthus vernonii*	
XANTHORRHOECEAE	*Xanthorrhoea* sp.	Grass Tree
ZINGIBERACEAE	*Patersonia* sp.	

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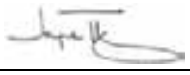
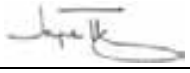
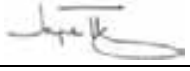
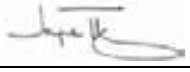
1	R Hamer, O Davies	J Tipping		A Horton	*A Horton*	19/08/10
2	R Hamer	J Tipping		A Horton	*A Horton*	24/08/10
3	R Hamer	J Tipping		A Horton	*A Horton*	22/09/10
3	C.Klein	J Tipping		A Horton	*A Horton*	8/10/10