SOUTHERN HIGHLANDS

REGIONAL SHOOTING COMPLEX

CONSERVATION AREA MONITORING

AND

BIOMETRIC CONDITION ASSESSMENT

Prepared by
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December 2011

Contents

1.0 Introduction

The Office of Communities (Sport and Recreation) has entered into a Conservation Agreement under provisions of the National Parks and Wildlife Act 1974 signed between the Minister for the Environment and the Minister for Sport and Recreation for Lot 1, DP 1088254. This statutory Agreement details the conservation values of the site and incorporates the owner's commitment to those values. It became effective on 12 October 2010. The zoning for the site results in a total of 136 hectares being zoned 1 and 2 (development area), and 900 hectares zoned 3, the entire area is covered under the Conservation Agreement.

The area was previously a part of the Bargo State Conservation Area under the Minister administering the National Parks and Wildlife Act 1974. Management of the natural area is based on the Nattai Reserves Plan of Management (2001).

This 2011 report is submitted as a condition of the Conservation Agreement (Annexure C, 'Monitoring' w to z), and presents baseline data for future yearly monitoring reports.

Monitoring

w) A comprehensive, measurable monitoring program including baseline information and data to be implemented consistent with requirements under any development approval and best practice guidelines to ensure that any existing or 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 when development is completed.

y) Photographs at the identified (and future) photo-points should be taken from time to time in consultation with Department's 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 the Office of Environment and Heritage (OEH).

2.0 Site Description

The site is located within the Southern Highlands region and the jurisdiction of the Wingecarribee Shire Council. 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. The adjacent 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.

Topographically and geologically the area is transitional between the Cumberland Plain of the Sydney Basin, and the southern uplands. The area is comprised of a deeply incised landscape of ridges and

gullies. The shooting complex is located on the top of the ridge where it is flat to gently sloping. The ridge then drops steeply into two tributaries of the Rocky Waterholes Creek. All watercourses are upper tributaries of the Nattai River. Rocky Waterholes Creek, in the south of the area, drains directly to the Nattai River approximately 6 km to the west of the existing Hill Top Rifle Range. The Nattai River drains north to Lake Burragorang.

3.0 Conservation Values

The Hawkesbury Nepean Catchment Management Authority has classified 98% of the Nattai River as being 'Near Intact' (cited from GHD, February 2008).

A recent study of the vegetation of the Nattai and Bargo reserves identified two broad vegetation groups within the plan area: Sheltered sandstone Forests on the slopes and Sandstone Shrub woodlands on the ridge-tops. Wet gully vegetation communities occur along the deeply incised creeklines.

The vegetation on the site is dominated by a mix of Eucalypt 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*) (GHD February 2008). No Endangered Ecological Communities have been identified.

The site 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, July 2008)

The area provides a wide range of habitat for a variety of fauna, due to the extensive areas of intact vegetation, the presence of mature, hollow-bearing trees, a wide variety of food sources, extensive shrub and canopy habitats and deep leaf litter. Areas of rocky, sandstone platforms and small cliff lines provide crevices, overhangs, cracks and rocks suitable as sheltering and foraging sites provide habitat for a wide range of fauna including reptiles and mammals (GHD, July 2008).

The area supports potential and known habitat for a number of threatened flora and fauna species as shown below (cited from GHD February 2008). Three Threatened fauna species have been located in the area, they are Barking Owl (*Ninox connivens*), Koala (*Phascolarctos cinereus*) and Yellow Bellied Glider (*Petaurus australis*). Other threatened fauna species may also occur in the area.

4.0 Additional Site Monitoring

Several documents have been prepared for the site by Sport and Recreation as per the development Conditions of Approval, these include:

- Construction Environmental Management Plan (CEMP)
- Ecological Management Plan (EMP)
- Bushfire Management Plan
- Soil and Water Management Plan, and
- Water Cycle Management Plan.

These plans can be viewed online at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=1051

The EMP outlines monitoring to be carried out by the Sport and Recreation after construction is completed. Future reports will contain all the data from this additional site monitoring, including:

- 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)

This monitoring data was not available at the time of writing this report, however will be included in all future reports.

A summary of management actions required by the EMP is located in Appendix 1.

5.0 Site condition assessment and Biometric data collection

The Office of Environment and Heritage (OEH) provides a monitoring protocol for all Conservation Agreements. This report sets the baseline data for future monitoring of the site. This monitoring protocol and monitoring reports will form the basis for and guide future management and monitoring of the conservation area.

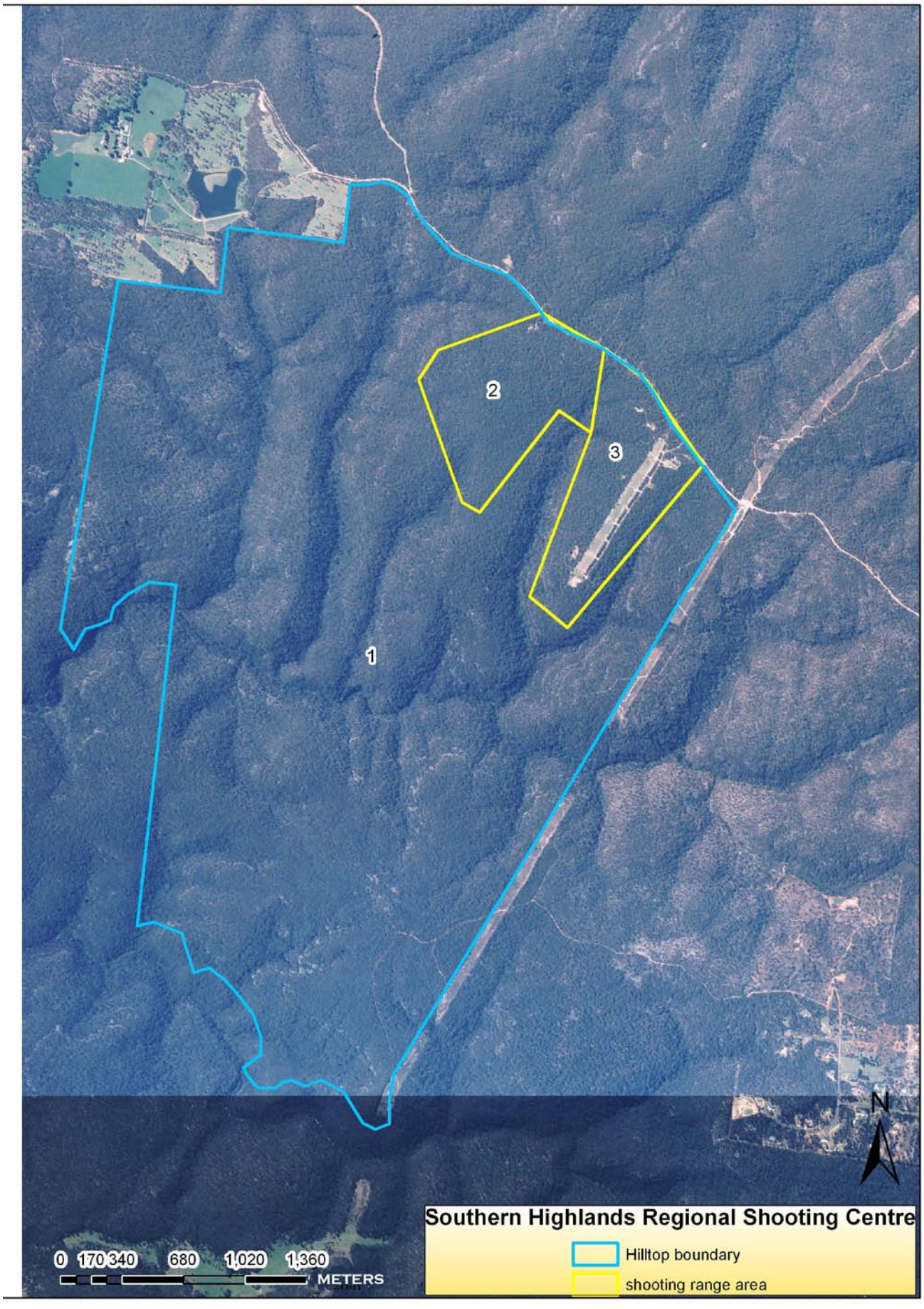
The data presented in this report represents the establishment of monitoring plots and baseline data to provide a basis for future annual reports. A total of 7 photo-point locations and 6 monitoring plots have been established (Map 2).

Photo-points and plots have been selected so as to provide information over time if any impacts from the development in Zones 1 and 2 are occurring within Zone 3 of the Conservation Area. To this end, the monitoring plots are generally located close to the boundary of the zones. The vegetation on site is generally uniform across the area, therefore this was not used as a criteria in selecting plot locations.

Photopoints (except for photopoint 3, where no plot data was undertaken) were taken while standing at one of the plot markers and taking photos looking North, South, East and West. Photopoint photos are stamped with the date and time when the photo was taken. Additional photos were taken if it was considered beneficial for future monitoring purposes.

Plots are typically a 20m x 20m plot, except for Plot #4 which is a 6m x 60m plot, as its aim is to monitor the efficacy of the fence blocking vehicle (including motorbike) access to the track. Plots were marked on all 4 corners with 40 cm steel star pickets with yellow plastic caps.

Photopoint and/or Plot No.	Grid Reference (GDA 94)
1	265573 6199190
2	265540 6199076
3	265263 6197520
4	265119 6197472
5	264843 6200465
6	265435 6200643
7	265680 6199995



Map 1. showing Conservation Area Zones.

6.0 MONITORING REPORT FORM

This form is being completed for the following reason:

√ Annual Report by landholder (self reporting)
□ Routine visit by OEH with landholder
□ Compliance visit by OEH with landholder
□ Change of ownership visit by OEH with landholder

√ Conservation Agreement
□ Wildlife Refuge
□ Property Agreement

Please make three copies of the completed form and any additional information. One to be retained by the landowner, one for the local Area office of NPWS and the third to go to Conservation Partnerships Delivery Unit, OEH, PO Box A290, Sydney South NSW 1232.

A LANDOWNER AND PROPERTY DETAILS

Property Owner	Office of Communities (Sport and Recreation)
Property Name	Southern Highlands Regional Shooting Complex
Property Address	Wattle Ridge Road, Hilltop, NSW
CA number	0280
Area (ha)	1,036 ha
CMA Region	Hawkesbury-Nepean
Agreement signed	12 October 2010
Date of last monitoring visit	N/A
Date of visit	18/10/2011 and 24/10/2011
Officer undertaking visit	M. Turton./ B. Thompson.

B LANDHOLDER OVERVIEW SINCE LAST VISIT

1 LANDHOLDER EXPERIENCES RELATING TO THE IMPLEMENTATION OF THE CONSERVATION AGREEMENT /WILDLIFE REFUGE

Points to note	***Comments***
Lot 100, DP1088254 was initially visited prior to 2010 in preparation of the agreement for signature by the respective ministers. During the later part of 2010 and for the majority of 2011, an area of the Lot in Zone 2, has been cleared and developed as a regional shooting complex. During this time the developers were responsible for implementing the CEMP. A fire trail that goes through the southern side of Rocky Waterholes Creek has been mistakenly fenced off by the developer. This is being modified to have a linking wire gate and warning signage.	Sport & Recreation is progressing the appointment of an environmental management contractor to ensure that the environmental obligations under the various management plans and the Conservation Agreement are addressed.

☐ **Please place an X in this box if new issue(s)/problem(s) require management help**

2 WORKS UNDERTAKEN SINCE LAST VISIT

Description of work undertaken	*Source of funding and amount*	*Date completed*
A Construction Environmental Management Plan (CEMP) has been prepared to guide environmental management during this construction phase. The CEMP provides a system and procedures to address and mitigate potential impacts to the environment and contains mitigation measures detailed in the Environmental Management Plan, 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.		August 2010
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). The Operational Environmental Management Plan (OEMP) will guide site management post construction and the Ecological Management Plan (EMP) guides management of the natural areas in all three zones.		August 2010
At the time of writing Site clearance within Zone 2 has been undertaken for development of the new Southern Highlands Regional Shooting Complex. Conclusions from the EMP relevant to the conservation area are listed below: A number of vegetation surveys and mapping have been undertaken at the site 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. No Endangered Ecological Communities (EEC's) have been found within the three zones. Regular monitoring of the vegetation and annual reviewing of the quadrats in this report will enable changes in vegetation to be recognised quickly and management response implemented if required.		December 2010

Actions that were to be undertaken under the CEMP included the following items – results are listed with each item. Pre-clearance surveys included identification of habitat features within the construction footprint, including hollow-bearing trees, hollow logs, bush rock, wombat burrows and termite mounds. Supervision of initial vegetation clearance was undertaken within the construction footprint to assist the clearance team avoid recorded habitat features and to check for injured fauna. Supervised felling of hollow-bearing trees commenced on 23 October 2010. **Action: Baseline weed mapping** in accordance with the Weed Management Strategy. **Result:** The vegetation within Zone 1 (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). Weed mapping has been carried out		October 2010 October 2010

A weed mapping report has been prepared. **Action: Identification and of hollow-bearing trees and logs** to be cleared in accordance with the Habitat Clearing and Hollow Tree management procedure. **Result:** Pre-clearance, a total of 155 hollow-bearing trees were recorded within the construction footprint. The majority of trees containing hollows were Blue-leaved Stringybark (*Eucalyptus agglomerata*). Few hollow-bearing trees showed evidence of fauna use. Limited trees had scratches and no scats from arboreal fauna were recorded. Only reptiles were found following the felling of hollow bearing trees and were assisted to relocate. A total of 32 hollow-bearing logs were recorded within the construction footprint. No fauna was recorded utilising the hollow-bearing logs at the time of survey. Only hollow-bearing trees that had been left for at least 24 hours following initial clearing were permitted to be felled. Trees were tapped several times prior to being slowing pushed over and then immediately inspected for the presence of fauna. Fauna detected within the construction footprint were either encouraged to move outside the footprint, or were collected using appropriate techniques and relocated within the retained bushland (Cumberland Ecology, 2010). **Action: Identification of Wombat burrows** and installation of one-way wombat gates; **Result:** Nine wombat burrows were recorded within the construction footprint. None of the recorded wombat burrows were considered to be active, with only limited burrows containing scats. Scats recorded at the burrows showed signs of decomposition. No installation of one-way wombat gates has been carried out. **Action: Inspection of termite mounds** for evidence of nesting by Rosenbergs Goanna and egg retrieval and management in consultation with OE&H; **Result:** A total of 10 termite mounds were recorded within the construction footprint, with additional		October 2010 October 2010

mounds noted outside of the footprint. None of the termite mounds showed evidence of use by Rosenberg's Goanna (*Varanus rosenbergi*).		October 2010
Action: Identification of rocky outcrops or ledges within the construction footprint to be searched for native fauna immediately prior to clearing activities and removal. **Result:** The majority of bushrock recorded within the construction footprint occurs within the Pistol Range, with rock platforms occurring along the northern boundary. There were scattered occurrences of bushrock within the Rifle Range. No fauna was recorded in the vicinity of the bushrock at the time of survey.		October 2010
Action: Identification of Hollow Trees and Yellow-bellied Glider sap-feeding trees for retention in vicinity of car park and along access roads, where possible. **Result:** Pre-clearance, a total of 155 hollow-bearing trees were recorded within the construction footprint. The majority of trees containing hollows were Blue-leaved Stringybark (*Eucalyptus agglomerata*). Few hollow-bearing trees showed evidence of fauna use. Limited trees had scratches and no scats from arboreal fauna were recorded. Some trees within and adjacent to the construction footprint contained scars from glider feeding, however it was not possible to ascertain which species of glider utilised the trees for feeding purposes.		October 2010
Action: Identification of transportable habitat features (eg large logs, rocks) to relocate during clearing activities into retained habitats under advice of Project ecologist. **Result:** Post-clearance, fallen logs and felled hollow-bearing trees have been reinstated by an excavator over the boundary fences. In general, logs have been placed close to the fence (usually within 3m) but are spread across entire boundary area, rather than piled at one location. There is no apparent way of translocating any of these logs to sites further into the adjacent vegetation without causing damage to the vegetation. The majority of the logs placed over the boundary fence are felled		

trees, with only a handful (5- 10) of the logs seen being old fallen logs. (Cumberland Ecology, 2010).		October 2010
Vertebrate Pests: The density of feral pest species within the zones 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*). Wild pigs, Deer and Goats may also be present. Feral Pest movement throughout the area is likely to be centred on the few tracks in the area. No feral animal monitoring or control has been carried out within the SHRSC to date.		
Phytophthora: There is no evidence of either Phytophthora (*Phytophthora cinnamomi*) or Amphibian Chytrid Fungus within the SHRSC area, nor is either pathogen currently known to be present within the Bargo State Conservation Area. 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. Testing for these pathogens has not been carried out within the SHRSC to date.		October 2010
Water quality testing: Testing of water discharges from the sediment ponds has been carried out.		July & August 2011
Water testing on Rocky Waterholes Creek has been undertaken by the construction contractor and Sport and recreation are awaiting those results.		November 2011

3 FIRE HISTORY MONITORING

Date of fire	*Area burnt (% of c.a./approx ha)*	*Reason (hazard red./wild)*	*Intensity (low/medium/high)*
2002/2003	80%	Wildfire	Medium to high

4 VISITATION

Average No. of Visitors	*Purpose of Visitation*	*Visitation effects*	*Strategies to overcome effects*
Approx. 10 people on site at any one time during construction. 1,509 visitors over the period 1st November 2010 to 31st October 2011.	Construction workers in Zone 2. Recreational shooters in Zone 3	Detention basin potentially impacting on Zone 1. Potential for spread of Phytophthora and Myrtle rust	Strict compliance with site hygiene protocols in Zone for both workers and visitors to the site.

5 COMMUNITY CONSULTATION AND INPUT INTO DECISION MAKING

Type of Involvement	*Numbers involved*	*Outcomes*
Meeting with representatives of the Hilltop Residents Action Group Inc and their consultants regarding the noise modification in May 2011.	Approx 12	Issues regarding noise management and the modification application discussed .

C CONSERVATION VALUES

	Conservation Values noted in Agreement and its significance	**Current condition ** (I = improving M= maintain D= declining)** *Anecdotal evidence only available at present*	**Current and emerging threats**	**Level (*severe, high, moderate or low*) and extent (*throughout, widespread, scattered or localised*) of threats**	**New findings; any other relevant information.**
Landscape/ Catchment - World/national heritage listings - Landscape & scenic values	The 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.	M.	Current: Scenic values have declined due to clearing of Zone 2.	High, localised within Zone 2. Site will stabilise and edges rehabilitate over time.	It appears that clearing has extended outside of the Zone 2 boundary into Zone 1, in the vicinity of the 50m range detention basin. This needs to be verified, documented and mapped.
Biological - Vegetation Communities - Flora - Fauna & habitat - Water bodies	The conservation area contains a high level of floristic diversity comprising largely of undisturbed sandstone shrub woodland, heath woodland and mallee vegetation communities. Sheltered Sandstone Forest occurs on sandstone slopes that descend into steeply dissected gullies and creeklines throughout the conservation area. The gullies and creeklines have moist forest vegetation communities present. The conservation area contains regionally rare and significant plant species, such as *Eucalyptus apiculata*. The conservation area contains 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*	M	Emerging: Weed invasion, predominantly along tracks and water courses. Emerging: potential to impact upon water quality.	Low Medium	Dead vegetation was observed at the end of the 800m rifle range in Zone 3, the cause of this requires immediate investigation and remediation.

	Threatened Species Conservation Act, 1995.				
Geological	Sandstone bisected by small creeks	M	Current: Some bushrock removal during site clearance in Zone 2.	Low -localised	
Cultural Heritage - Aboriginal - Historic	The area was used and continues to be use by the Gundungurra and Dharawal Aboriginal people. The conservation area contains artefact scatters and may contain other sites of cultural significance.	M	Current: Potential for disturbance during construction.	Low – localised. Artefact scatters identified pre-construction. These sites were not able to be found during subsequent searches.	
Research/ education	No research is proposed at this stage, however there is potential for ecological and archaeological research to be carried out within Zone 1 of the conservation area.				
Other					

**** Current Condition: determine change by comparison with previous Condition Assessments (Pages 5 to 8). Carry out new assessment if not done previously. Biometric can also be used.**

D MANAGEMENT ISSUES

	Describe the Issue (short description of current extent of impacts, new sightings and any other relevant information	**Description of planning and implementation of control measures being and to be undertaken, and duration**
Weeds (where applicable, infestation can be given as a % of total vegetation)	There is currently a low level of weeds present within all zones of the Conservation Area. Main weed infestations occur along the roadsides. New weed incursion may occur due to clearing and introduction of weed propagules.	Weed incursions to be noted and treated as soon as identified. Weed control to be carried out by qualified bush regenerator. Any landscaping or assisted regeneration at the site will be undertaken using native plant species of local provenance. Non-viable, non-invasive turf to be used in grassed areas

		A weed management strategy is in place (EMP). Weed mapping has been carried out.
Water Quality	The majority of water leaving the construction site experiences controlled discharge via sedimentation basins. This discharge is to be carried out at very low levels and spread over a wide area to avoid erosion downstream of discharge points. Water quality monitoring is required. Dark seepage has been noted at the end of the 800m range in Zone 3, this may be the cause of dead vegetation at this site.	Pumping records for water discharges have been undertaken. Water quality monitoring in drainage lines or Ricky Waterholes Creek has not been undertaken to date. Water quality monitoring should be undertaken in Rocky Waterholes Creek. Water quality testing to be undertaken when water is present in ephemeral drainage lines, in particular those drainage lines behind ranges. Water quality testing is to be carried out at the end of the range in Zone 3, below mulched area.
Pest Animals - Feral - Domestic - Native	Pest animal numbers are low in the area, and are unlikely to increase as a result of this development. Foxes, Wild dogs and rabbits are the predominant pests in the area.	Monitoring of the presence of feral vertebrate pests should be carried out with sand plots. Continuation of involvement with local pest control programs (CMA) and with OE & H feral control programs.
Fire Management	Date of last fire occurred in the 2002/2003 summer period. The majority of the area appears to have been affected, however some of the wetter gullies may remain unburnt.	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. It is intended that fire management in the Plan area will be integrated with existing programs for the surrounding OE& H estate (as appropriate).
Threatened species; endangered ecological communities etc	Feed trees of Yellow-bellied Glider have been cleared within Zone 2.	Hollow-bearing trees and Yellow-bellied Glider sap-feeding trees were to be retained in the car park area and along access roads as far as possible. Monitoring of Yellow-bellied Glider populations to be carried out regularly to determine impacts on the populations.

Cultural Heritage Management	Aboriginal artefacts have been found in a few locations within the Conservation Area. One site, identified as 'Hill 1', is located near the construction area in Zone 2. The location of this site has not been verified.	The CEMP (2010) stated: Where practicable, impact to the identified Aboriginal site Hill 1 be avoided, or • If impact to the Aboriginal site Hill 1 cannot be avoided then the artefact to be collected or relocated away from the area of impact; and • If any Aboriginal artefacts are discovered during construction, all work is to cease in the area and the project manager be notified immediately. The project manager would be responsible for informing the OE & H and the Local Aboriginal Council.
Visitor Impact Management	Visitation by the public has not yet increased to Zone 2, as facilities have not been completed. Visitation to Zone 3 remains stable. The existing shooting range had 1,509 visitors over the period from the 1st November 2010 to 31st October 2011. These numbers will increase when the new ranges are completed.	Visitor impacts to be monitored by Sport and Recreation, and covered in future reports.
Community Consultation and input into decision making.	Consultation with Hilltop Resident Action Group Inc re: noise management.	Awareness of community feeling to be regularly assessed, and taken into consideration for continuing management of the site.
Research/ Education programs	No research or education programs are being carried out at the present time, however there is great potential for research into the ecological	
Other permitted uses -vehicle access - use of timber -seed collection - etc	Bio-security issues and potential introduction of Phytophthora (*Phytophthora cinnamomi*) and Amphibian Chytrid Fungus. 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 and	Implement Biosecurity Management Procedure (EMP, Appendix E). Establish foot and vehicle/machinery washdown and disinfectant sites. Access to surrounding bushland to be 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 to be restricted to designated access tracks and parking areas. Minimise disturbance of soil and vegetation through clear demarcation of the construction area and restricted

	associated habitat values. Access to trails through Zone 1 to be restricted. Heavy metal and chemical contamination. Rehabilitation of disturbed areas	access to the Zone 1 environmental conservation zone. 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. The fire trail that goes through Zone 1 on the southern side of Rocky Waterholes Creek has been fenced off at the powerline easement, restricting vehicular traffic. This site to be monitored to determine effectiveness of fencing. 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 to 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; • Collection and analysis of fauna carcasses for lead or heavy metal contamination (where the opportunity arises). (GHD, 2010). This monitoring program will be introduced when the construction phase is complete. Disturbed areas are being 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.

E WORKPLAN TO ADDRESS MANAGEMENT ISSUES (in priority order)

Action to be completed or ongoing action (discuss on site and where necessary confirm details later)	*Cost and possible funding sources*	*Completion Date*	*Responsibility (landholder, OEH, other)*
It appears that clearing has extended outside of the Zone 2 boundary into Zone 1, in the vicinity of the detection basin. This needs to be verified, documented and mapped.	In house	Dec. 2011	Landholder
Dead vegetation has been noted at the end of the rifle range in Zone 3 (see map). Possible cause may be nutrient flows from the extensive mulching at this site. Cause of vegetation death to be identified and remedied. Soil and water sampling to be carried out at this location. Once cause of vegetation death has been identified, remediation to be put in place immediately.	$1,500	Dec. 2011	Landholder
Site hygiene protocols are essential to prevent spread of Phytophthora, Myrtle rust and weed propagules. Hygiene protocols to be implemented by contractors and visitors to the site.	$5,000 As per CEMP.	Start immediately Ongoing.	Landholder
Water quality monitoring. Establishment of water monitoring points in Rocky Waterholes Creek and drainage lines leading from Zones 2 and 3.	$10,000	Ongoing	Landholder
Weed control	$6,000 annually. (monitoring and control)	Ongoing	Landholder
Remediation of disturbed areas.	$30,000	Dec. 2011	Landholder
Pest animal monitoring with sand traps.	$5,000 annually.	Ongoing	Landholder

F ATTACHMENTS

√ Map showing location of main issues within the Conservation Area.

List further attachments if relevant:

√ Photos from previously/new identified photopoints (refer 6.0)

√ Rapid Assessment Sheets for previous/new sites. (refer 6.0)

√ Other Monitoring results. (refer 6.0)

I/we confirm a field inspection has been undertaken and this form is a summary of the conservation values and management issues discussed.

Signature: _____ _____
Landowner Visiting OEH/NPWS Officer, if applicable

Date report completed: _____

Level of threat definition

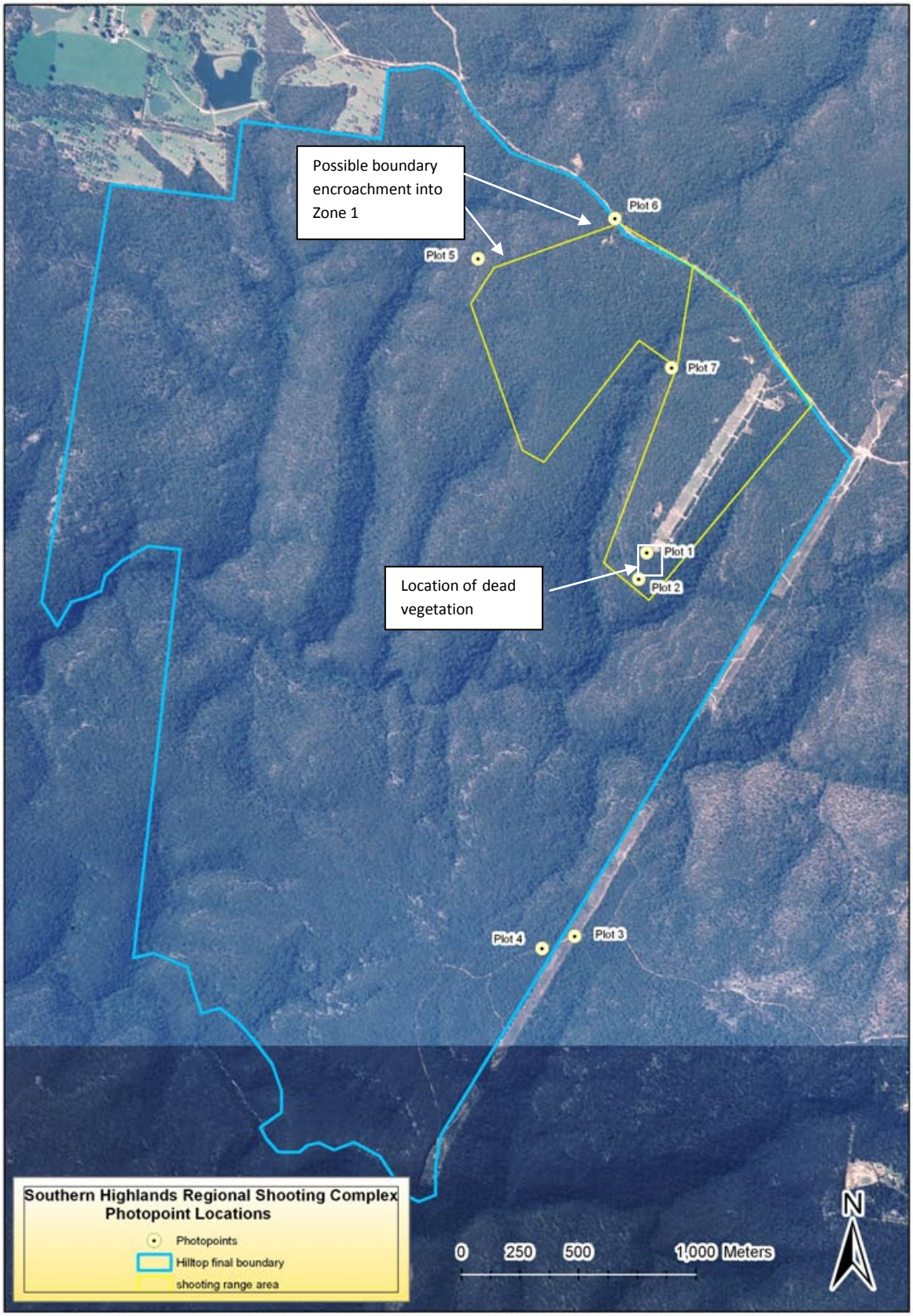
Table 4 Description of the level of impact categories (adapted from State of the Parks 2007 Guidelines)

Impact of the threat	Description of category
Severe	The threat will lead to loss of property value(s) in the foreseeable future if it continues to operate at current levels
High	The threat will lead to a significant reduction of property e values(s) if it continues to operate at current levels.
Moderate	The threat is having a detectable impact on reserve values(s) but damage is not considered significant.
Mild	The threat is having minor or barely detectable impact on property value(s).

Extent of threat definition For cultural heritage places, sites and objects, classify the extent the impact is having on the place/site/object itself.

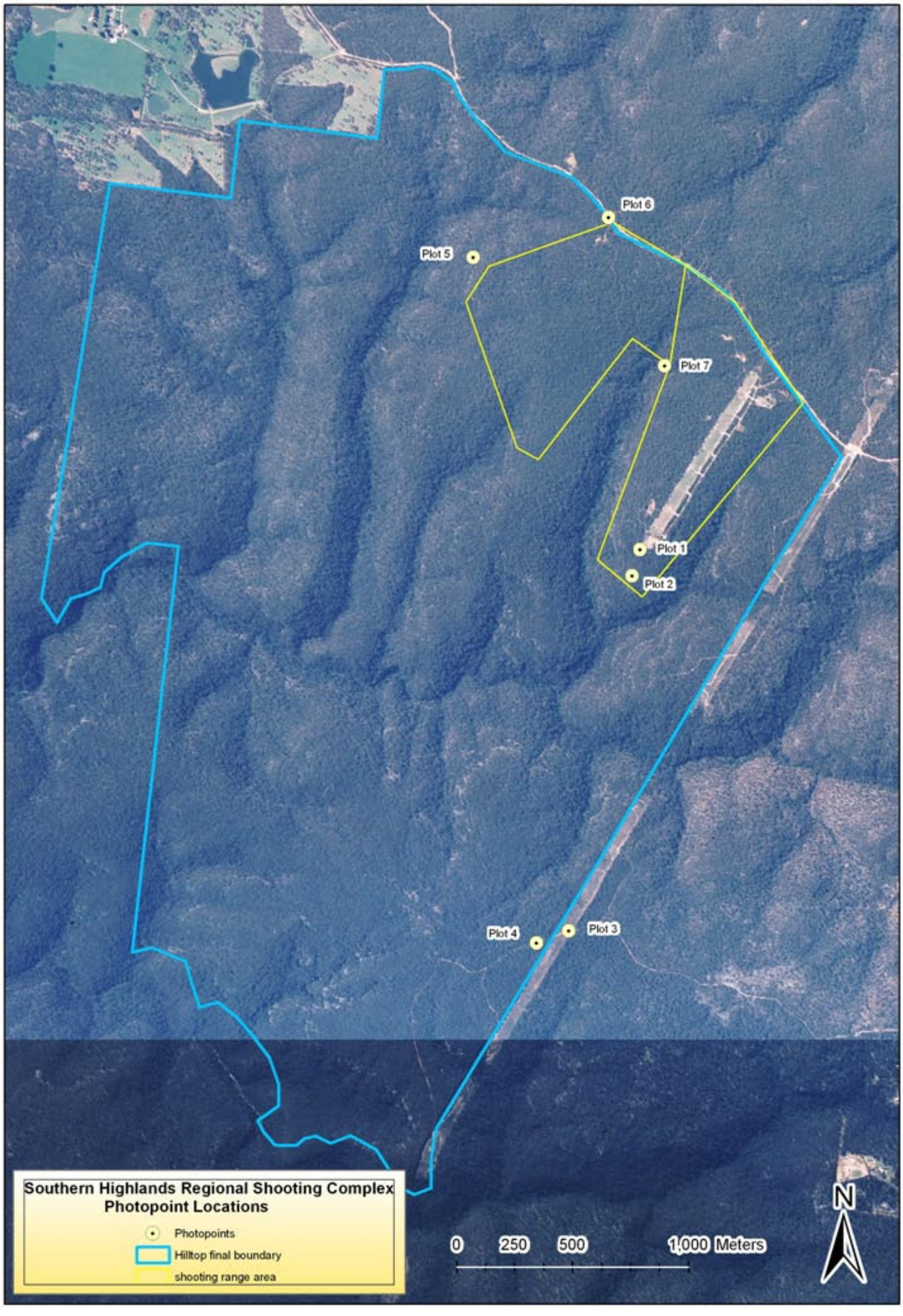
Table 5: Description of the extent categories (adapted from State of the Parks 2007 Guidelines)

Extent of the threat	Description of category
Throughout	The impact is occurring in 50% or more of property area/cultural place/site/object.
Widespread	The impact is occurring in more than 15% but less than 50% of reserve area/cultural place/site/object.
Scattered	The impact is occurring in between 5 and 15% of reserve area/cultural place/site/object.
Localised	The impact is occurring is less than 5% of reserve area/cultural place/site/object.



Location of issues raised within Monitoring Report

7.0 Photo-Points, Plot Data and Condition Assessments



7.1 Photo-point 1 and Plot 1 data

Photopoint 1. Looking North from NW plot marker (GR 265573 6199190 GDA 94) Note dead vegetation

Photopoint 1. Looking South from NW plot marker (GR 265573 6199190 GDA 94) Note dead vegetation.

Photopoint 1. Looking East from NW plot marker (GR 265573 6199190 GDA 94)

Photopoint 1. Looking West from NW plot marker (GR 265573 6199190 GDA 94)
Note dead vegetation

Site Value – plot data sheet

Start a new sheet for each zone. HILLTOP RIFLE RANGE MONITORING

Biometric

SITE NO PLOT 1 ZONE NO 56 RECORDERS Wyn Jones

LOCATION DESCRIPTION Southern Highlands Regional Shooting Complex DATE 24/10/201

LAND TENURE NSW Govt. State Sporting Venues Authority LAND MANAGER Office of Communities (Sport and Recreation)

Vegetation formation (as per Keith 2004) Sydney Hinterland Dry Sclerophyll Forests

Vegetation class (as per Keith 2004) Dry Sclerophyll Forests

Vegetation class (on ground) Open Forest - *Eucalyptus sieberi – Corymbia gummifera*

Vegetation type (Biometric) Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin

Landscape (Mitchell 2002) __Nattai Plateau_____

CMA _Hawkesbury-Nepean_____SITE PHYSICAL CHARACTERISTICS ASPECT 180 SLOPE 1

AMG (GPS datum: GDA 94	Benchmarks	1 NW	2 SW	3 SE	4 NE
Easting		265573	265567	265586	265588
Northing		6199190	6199175	6199172	6199188

20 x 20m plot

Number of native plant species	40				
Native over-storey cover (%) -use alternative method below if appropriate		30	40	10	20
Native mid-storey cover (%)		10	0	10	10
Native ground cover – grasses (%)		0	0	0	0
Native ground cover – shrubs (%)		20	10	70	30
Native ground cover – other (%)		10	10	20	20
Exotic plant cover (%)		0	0	0	0

(use cover abundance score for all percent figures and select mid-point of % range to enter into Biometric)0

Larger sampling area (20m x 50m plot, or whole of zone)

Number of trees with hollows - use alternative method below if appropriate					
Over-storey regeneration (proportion of over-storey spp)					
Total length of fallen logs (m)					

Plot 1.

	Photo Point 1 and description
Looking North	N/W corner of plot, GR: 265573 6199190 Dead vegetation resulting from seepage from deep mulch layer. Good bush beyond.
Looking East	N/W corner of plot. GR: 265573 6199190 Dead vegetation resulting from seepage from deep mulch layer. Good bush beyond.
Looking South	N/W corner of plot. GR: 265573 6199190 Dead vegetation resulting from seepage from deep mulch layer. Good bush beyond.
Looking West	N/W corner of plot. GR: 265573 6199190 Good bush.

Site Value methodology prompts (for full details refer to Appendix 3 of *BioMetric* Operational Manual)

- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: The over-storey is the tallest woody stratum present (including emergents) above 1m. For example, in a woodland community the over-storey stratum is the tree layer and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum. The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration). The ground stratum contains all indigenous native vegetation below 1m in height. The ground stratum (grasses) refers to indigenous native vegetation of grasses (i.e. plants belonging to the family Poaceae).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other, and exotic): % Foliage Cover (FC) œ as defined in *BioMetric* Operational Manual
- Exotic plant cover: % Foliage Cover of all exotic species (i.e. all strata).
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration (≤5cm DBH, no height limits).

Cover abundance scale 1-7		
1	<5% - rare or few individuals	3 or less individuals
2	<5% - uncommon	More than 3 – sparsely scattered or localised
3	<5% - common	Consistent throughout plot
4a	<5% - very abundant	Many individuals throughout plot
4b	5% - 25%	
5	25% - 50%	
6	50% - 75%	
7	75% - 100%	

Plot Work Sheet **PLOT 1** **24/10/2011 3:50 PM EDST**

Native Trees (over-storey) Species list	**Regen (√)**	Native Lower Trees and Tall shrubs (mid – storey) species	Native Ground covers – Shrubs species	Native Ground cover – Grasses species	Native Ground cover – other (ferns, climbers) species	Exotic Plants Species List
Corymbia gummifera (4b)	√	*Corymbia gummifera* (5)	*Lambertia formosa* (2)	*Entolasia marginata* (2)	*Caustis flexuosa* (4b)	
Eucalyptus sieberi (4b)		*Acacia linifolia* (3)	*Persoonia levis* (2)		*Xanthosia pilosa* (4b)	
		Leptospermum trinervium (3	*Persoonia mollis* (3)		*Bossiaea obcordata* (4b)	
		Hakea dactyloides (3)	*Dillwynia sericea* (2)		*Patersonia glabrata* (2)	
			Monotoca scoparia (1)		*Lomatia silaifolia* (3)	
			Acacia suaveolens (2)		*Platysace linearifolia* (2)	
			Isopogon anemonifolius (1)		*Hybanthus vernonii ssp vernonii* (1)	
			Olax stricta (1)		*Gonocarpus teucrioides* (3)	
			Isopogon anethifolius (1)		*Pimelea linifolia* (2)	
			Cyathochaeta diandra (4b)		*Tetratheca thymifolia* (3)	
			Pteridium esculentum (1)		*Poranthera microphylla* (2)	
			Lomandra confertifolia ssp. rubiginosa (2)		*Phyllanthus hirtellus* (2)	Foliage Cover (%)
			Dillwynia retorta (4b)		*Eriostemon australasius ssp. australasius* (4b)	Av. crown diameter (m)= av. foliage cover (%) = # trees = sample area (ha) =
					Dampiera stricta (2)	
					Lomandra obliqua (2)	
					Boronia ledifolia (1)	# trees with hollows = 0 sample area (ha) =
					Xylomelum pyriforme (1)	Total length (m) of fallen logs (minimum 10cm diameter x 50 cm long) - 10m
					Telopea speciosissima (1)	
					Goodenia hereacea (1)	
					Gompholobium grandiflorum (1)	
					Conospermum taxifolium (1)	
Foliage Cover (%) 30		Foliage Cover (%) 30	Foliage Cover (%) 40	Foliage Cover (%) 1	Foliage Cover (%) 30	

Grazing	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Erosion	Intensity	Nil	Minor	Moderate	Severe	Very Severe	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Fire & Burning	Intensity	Nil	Light	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Clearing	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Cropping	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Logging	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Exotics and Noxious Weeds	Intensity	Nil	Very Low	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Feral sp.	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown

Habitat Features – Plot 1

Hollows under 5cm	Hollows 5-10cm	Hollows 11-20cm	Hollows >20cm
Yes	No	No	No
Peeling Bark	Fissures	Cracks	Stick Nests
Yes	No	Yes	No
Soil Cracks	Rocky areas	Caves	Mud Nests
No	No	No	No
Fallen Hollow Logs	Fallen Timber	Leaf Litter	Bare patches
No	Yes	Yes	No
Mistletoe	Acacia Sp.	Termite Mounds	Casuarina Sp.
No	Yes	No	No
Dam	Creek	River	Dead Trees
No	No	No	Yes

Is there a presence of

Other Valuable Habitat Features			
	Yes/No & brief description condition		Yes/No & brief description condition
Breeding/ roosting sites	Yes. Trees and small hollows	Rock Outcrops/ Formations	No
Habitat Garden/Constructed water feature	No	Weedy vegetation used as habitat	No
Cultivated areas used by wildlife	No	Built structures/non-structural features used as habitat	No

CONDITION ASSESSMENT NATIVE VEGETATION – PLOT 1

For native bushland and grassland sites and paddocks containing scattered shade trees

Site number or name: Plot 1	**Monitoring date: 24/10/2011**
Assessment questions	**Answer Yes, No or N/A**
1. Is the area fenced to manage stock access and grazing ? *Healthy bush should be rested for long periods to allow regeneration. To achieve this, it should be fenced off.*	**N/A**
2. Is there regeneration of native trees and shrubs, or if in grassland, regular germination of native herbs eg perennials such as lilies or orchids and annuals such as daisies? *Regeneration of trees and shrubs is necessary for the bush to maintain health, diversity and a range of habitats. An understorey of shrubs encourages small insect eating birds and other native animals.*	Yes
3. Is there a diverse range of tree and shrub species present, eg more than 20 (coast), 15 (tablelands), 10 (western slopes and plains)? (Note: healthy river red gum forest may have only one tree and 5-10 shrub species present). *Diversity encourages a range of native animals and helps the bush withstand attacks of insects and other adverse conditions.*	Yes
4. If grassland, is there a diverse range of grasses and broad leaf herbs present?	N/A
5. Is there adequate ground cover, eg leaves, bark and twigs, or litter (dead grasses)? *Ground cover indicates whether the area is being disturbed by stock and is a measure of tree canopy density and the domination of exotic grasses and weeds.*	Yes
6. Are mosses or lichens on rocks, fallen branches and the ground surface, or are these species, along with liverworts, forming a crust on bare soil?	N/A
7. Are weeds uncommon, sparsely scattered, absent, or mainly around edges of the area? *The understorey may have exotic weeds present. Too many are undesirable and you may need a management plan for their control. Weeds compete with native plants for light, space, water and nutrients.*	Yes
8. Is there a very low incidence of pest animals, eg foxes and rabbits? *Remnant bush can be a refuge for pest animals as well as natives. The feral animals should be controlled.*	Yes
9. Is the patch shape a block or part of a corridor more than 30 metres wide rather than a thin strip? *Blocks of native vegetation have less edge area than strips, so they are less influenced by changes in levels of weeds, predators, noise and climatic effects.*	Yes
10. Is the area greater than 1 ha (coast), 5 ha (tablelands), 10 ha (western slopes), 20 ha (plains), 50 ha (Western Division)?	Yes
11. Is the remnant linked to other remnants by corridors, eg. roadside vegetation, or scattered trees no more than 50 m apart ? *Corridors provide shelter and pathways for native organisms (other than birds) to move over the landscape for feeding, breeding, roosting and expanding territory*.	Yes
12. Is there a mix of tree ages present, ie saplings through to old growth with hollows ? *A range of ages and conditions means the bush is regenerating itself and each*	Yes

stage of growth is suitable habitat for native organisms.	
13. If trees are present is an understorey also present? *An understorey of shrubs encourages small insect eating birds and other native animals.*	**Yes**
14. Is the understorey mostly comprised of native shrubs and / or grasses and broad leaf herbs?	Yes
15. Area there standing trees (alive or dead) with hollows, present in the remnant or paddock ? *Dead trees with hollows are essential for roosting and nesting of a large range of native birds such as parrots and of bats.*	No
16. Are the trees mainly healthy, with little or no dieback? *Dieback is apparent if there are bare twigs at the outer part of the tree canopy. It is usually a sign of severe insect attack.*	No
17. Are there less than 20 % of trees affected by mistletoe? *Mistletoe is a parasite that invades trees and causes them to lose vigour. Where many trees in an area are affected it is likely to indicate that the area of vegetation is under severe stress.*	Yes
18. Are there logs and fallen timber on the ground? *Logs and dead material are essential habitat for smaller native organisms. But they can also be a harbour for pest animals.*	Yes
19. If scattered paddock trees are unfenced, are stock camps absent? *Bare ground, bare tree roots or the movement of soil all can indicate erosion which needs to be managed and controlled.*	N/A
20. If scattered paddock trees are unfenced, is evidence of stock ringbarking or rubbing absent?	N/A
21. Is the area free of herbicide, insecticide or fertiliser overspray from adjoining areas? *Herbicides and insecticides can kill native plants and small organisms. Fertiliser encourages exotic species by raising nutrient levels.*	No – large area of dying veg.
22. Is the area free from the threat of salinity and / or high water tables?	Yes
Total number of 'yes' answers	14

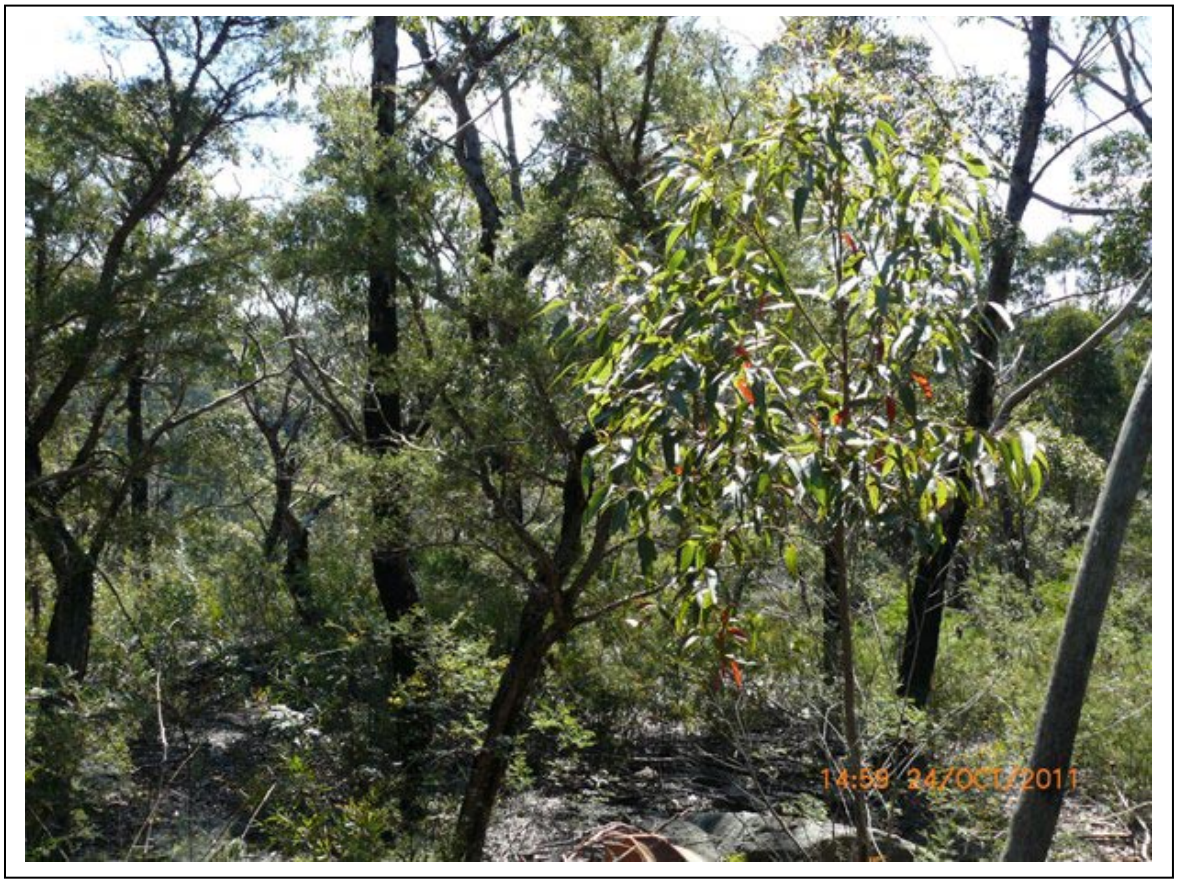
Condition rating - native vegetation				
Number of 'yes' answers			**Vegetation condition rating**	**Need for management attention**
Remnant bushland	**Remnant grassland**	**Scattered paddock trees**		
14 +	9 +	12 +	Mixed	Most of area healthy - Maintain current management. Area behind soil bank needs urgent attention to determine what is killing trees in this area – likely cause is high nutrients from fresh mulch that has been thickly applied to the area.
9 - 13	6 - 8	8 - 11	Good	Needs some management attention
5 - 8	3 - 5	5 - 7	Fair	Needs a significant level of management attention
0 - 4	0 - 2	0 - 4	Poor	Urgent management necessary if you wish to retain area as stock shelter

7.2 Photo-point 2 and Plot 2 data

Photopoint 2. Looking North from SW plot marker (GR 265540 6199076 GDA 94)

Photopoint 2. Looking South from SW plot marker (GR 265540 6199076 GDA 94)

Photopoint 2. Looking East from SW plot marker (GR 265540 6199076 GDA 94)



Photopoint 2. Looking West from SW plot marker (GR 265540 6199076 GDA 94)

Site Value – plot data sheet

Start a new sheet for each zone. HILLTOP RIFLE RANGE MONITORING

Biometric

SITE NO PLOT 2 ZONE NO 56 RECORDERS Wyn Jones

LOCATION DESCRIPTION _ Hilltop Rifle Range / Bargo Conservation Area_____ DATE 24/10/201

LAND TENURE NSW Govt. State Sporting Venues Authority LAND MANAGER Office of Communities (Sport and Recreation)

Vegetation formation (as per Keith 2004) Sydney Hinterland Dry Sclerophyll Forests

Vegetation class (as per Keith 2004) Dry Sclerophyll Forests

Vegetation class (on ground) Open Forest– *Corymbia gummifera - Eucalyptus piperita - Eucalyptus agglomerata*

Vegetation type (Biometric) Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin

Landscape (Mitchell 2002): Nattai Plateau

CMA _Hawkesbury-Nepean_____SITE ORIENTATION: ASPECT 320˚ SLOPE 2˚

AMG (GPS datum:_GDA 94)	Benchmarks	1 NW	2 SW	3 SE	4 NE
Easting		265543	265540	265559	265561
Northing		6199097	6199076	6199073	6199092

20 x 20m plot

Number of native plant species	42				
Native over-storey cover (%) -use alternative method below if appropriate		30	20	30	30
Native mid-storey cover (%)		20	20	5	10
Native ground cover – grasses (%)		0	0	0	0
Native ground cover – shrubs (%)		40	40	20	40
Native ground cover – other (%)		10	10	10	10
Exotic plant cover (%)		0	0	0	0

(use cover abundance score for all percent figures and select mid-point of % range to enter into Biometric)0

Larger sampling area (20m x 50m plot, or whole of zone)

Number of trees with hollows - use alternative method below if appropriate					
Over-storey regeneration (proportion of over-storey spp)					
Total length of fallen logs (m)					

Plot 2

	Photo Point 2 and description
Looking North	From S/W corner of plot, GR: 265540 6199076 Good bush
Looking East	From S/W corner of plot, GR: 265540 6199076 Good bush
Looking South	From S/W corner of plot, GR: 265540 6199076 Good bush
Looking West	From S/W corner of plot, GR: 265540 6199076 Good bush

Site Value methodology prompts (for full details refer to Appendix 3 of *BioMetric* Operational Manual)

- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: The over-storey is the tallest woody stratum present (including emergents) above 1m. For example, in a woodland community the over-storey stratum is the tree layer and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum. The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration). The ground stratum contains all indigenous native vegetation below 1m in height. The ground stratum (grasses) refers to indigenous native vegetation of grasses (i.e. plants belonging to the family Poaceae).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other, and exotic): % Foliage Cover (FC) œ as defined in *BioMetric* Operational Manual
- Exotic plant cover: % Foliage Cover of all exotic species (i.e. all strata).
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration (≤5cm DBH, no height limits).

Cover abundance scale 1-7		
1	<5% - rare or few individuals	3 or less individuals
2	<5% - uncommon	More than 3 – sparsely scattered or localised
3	<5% - common	Consistent throughout plot
4a	<5% - very abundant	Many individuals throughout plot
4b	5% - 25%	
5	25% - 50%	
6	50% - 75%	
7	75% - 100%	

Plot Work Sheet **PLOT 2** **24/10/2011**

Native Trees (over-storey) Species list	**Regen (√)**	Native Lower Trees and Tall shrubs (mid –storey) species	Native Ground covers – Shrubs species	Native Ground cover – Grasses species	Native Ground cover – other (ferns, climbers) species	Exotic Plants Species List
Eucalyptus piperita (4b)	√	*Corymbia gummifera* (2)	*Acacia terminalis* (4a)		*Pimelea linifolia ssp. linifolia* (2)	
Corymbia gummifera (4b)	√	*Acacia terminalis* (3)	*Acacia longifolia* (3)		*Gonocarpus teucrioides* (3)	
Eucalyptus agglomerata (1)		*Acacia linifolia* (2)	*Dillwynia retorta* (3)		*Caustis flexuosa* (2)	
			Acacia linifolia (2)		*Xanthosia pilosa* (3)	
			Persoonia linearis (2)		*Poranthera microphylla* (2)	
			Persoonia levis (2)		*Amperaea xiphoclada* (2)	
			Hakea dactyloides (2)_		*Tetratheca thymifolia* (3)	
			Banksia serrata (1)		*Lomandra obliqua* (3)	
			Banksia spinulosa ssp. spinulosa (2)		*Cassytha glabella* (1)	
			Grevillea sphacelata (2)		*Lomandra micrantha* (2)	
			Eriostemon australasius ssp. australasius (3)		*Lepidosperma confertifolia ssp. rubiginosa* (2)	
			Leptospermum trinervium (1)		*Patersonia glabrata* (3)	Foliage Cover (%)
			Gompholobium grandiflorum (2)		*Lomatia silaifolia* (3)	Av. crown diameter (m)=
			Philotheca hispidula (4)		*Dianella caerulea* (1)	av. foliage cover (%) =
			Petrophile pedunculata (3)		*Billardiera scandens* (1)	# trees = sample area (ha) =
			Bossiaea obcordata (2)		*Phyllanthus hirtella* (2)	# trees with hollows = 2 sample area (ha) =
			Boronia rigens (3)		*Monotoca scoparia* (1)	
			Dodonea triquetra (2)			
			Acacia ulicifolia (1)			
			Xylomelum pyriforme (1)			Total length (m) of fallen logs (minimum 10cm diameter x 50 cm long) - 40m
			Dampiera purpurea (1)			
			Grevillea sericea (2)			
Foliage Cover (%) 40		Foliage Cover (%) 10	Foliage Cover (%) 50	Foliage Cover (%) 0	Foliage Cover (%) 20	

Grazing	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Erosion	Intensity	Nil	Minor	Moderate	Severe	Very Severe	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Fire & Burning	Intensity	Nil	Light	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Clearing	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Cropping	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Logging	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Exotics and Noxious Weeds	Intensity	Nil	Very Low	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Feral sp.	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown

Habitat Features – Plot 2

Hollows under 5cm	Hollows 5-10cm	Hollows 11-20cm	Hollows >20cm
Yes	Yes	No	No
Peeling Bark	Fissures	Cracks	Stick Nests
Yes	No	Yes	No
Soil Cracks	Rocky areas	Caves	Mud Nests
No	Yes	No	No
Fallen Hollow Logs	Fallen Timber	Leaf Litter	Bare patches
No	Yes	Yes	No
Mistletoe	Acacia Sp.	Termite Mounds	Casuarina Sp.
No	Yes	No	No
Dam	Creek	River	Dead Trees
No	No	No	Yes

Is there a presence of

Other Valuable Habitat Features			
	Yes/No & brief description condition		Yes/No & brief description condition
Breeding/ roosting sites	Yes. Trees and hollows	Rock Outcrops/Formations	Yes – cliff line and rocky outcrops.
Habitat Garden/Constructed water feature	No	Weedy vegetation used as habitat	No
Cultivated areas used by wildlife	No	Built structures/non-structural features used as habitat	No

CONDITION ASSESSMENT NATIVE VEGETATION – Plot 2

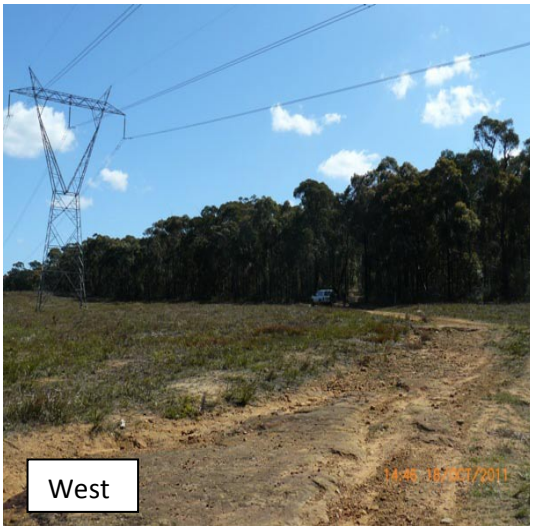
For native bushland and grassland sites and paddocks containing scattered shade trees

Site number or name: 2 **Monitoring date: 24/10/2011**	
Assessment questions	**Answer Yes, No or N/A**
1. Is the area fenced to manage stock access and grazing ? *Healthy bush should be rested for long periods to allow regeneration. To achieve this, it should be fenced off.*	**N/A**
2. Is there regeneration of native trees and shrubs, or if in grassland, regular germination of native herbs eg perennials such as lilies or orchids and annuals such as daisies? *Regeneration of trees and shrubs is necessary for the bush to maintain health, diversity and a range of habitats. An understorey of shrubs encourages small insect eating birds and other native animals.*	Yes
3. Is there a diverse range of tree and shrub species present, eg more than 20 (coast), 15 (tablelands), 10 (western slopes and plains)? (Note: healthy river red gum forest may have only one tree and 5-10 shrub species present). *Diversity encourages a range of native animals and helps the bush withstand attacks of insects and other adverse conditions.*	Yes
4. If grassland, is there a diverse range of grasses and broad leaf herbs present?	N/A
5. Is there adequate ground cover, eg leaves, bark and twigs, or litter (dead grasses)? *Ground cover indicates whether the area is being disturbed by stock and is a measure of tree canopy density and the domination of exotic grasses and weeds.*	Yes
6. Are mosses or lichens on rocks, fallen branches and the ground surface, or are these species, along with liverworts, forming a crust on bare soil?	Yes
7. Are weeds uncommon, sparsely scattered, absent, or mainly around edges of the area? *The understorey may have exotic weeds present. Too many are undesirable and you may need a management plan for their control. Weeds compete with native plants for light, space, water and nutrients.*	Yes
8. Is there a very low incidence of pest animals, eg foxes and rabbits? *Remnant bush can be a refuge for pest animals as well as natives. The feral animals should be controlled.*	Yes
9. Is the patch shape a block or part of a corridor more than 30 metres wide rather than a thin strip? *Blocks of native vegetation have less edge area than strips, so they are less influenced by changes in levels of weeds, predators, noise and climatic effects.*	Yes
10. Is the area greater than 1 ha (coast), 5 ha (tablelands), 10 ha (western slopes), 20 ha (plains), 50 ha (Western Division)?	Yes
11. Is the remnant linked to other remnants by corridors, eg. roadside vegetation, or scattered trees no more than 50 m apart ? *Corridors provide shelter and pathways for native organisms (other than birds) to move over the landscape for feeding, breeding, roosting and expanding territory*.	Yes

12. Is there a mix of tree ages present, ie saplings through to old growth with hollows ? *A range of ages and conditions means the bush is regenerating itself and each stage of growth is suitable habitat for native organisms.*	Yes
13. If trees are present is an understorey also present? *An understorey of shrubs encourages small insect eating birds and other native animals.*	**Yes**
14. Is the understorey mostly comprised of native shrubs and / or grasses and broad leaf herbs?	Yes
15. Area there standing trees (alive or dead) with hollows, present in the remnant or paddock ? *Dead trees with hollows are essential for roosting and nesting of a large range of native birds such as parrots and of bats.*	Yes
16. Are the trees mainly healthy, with little or no dieback? *Dieback is apparent if there are bare twigs at the outer part of the tree canopy. It is usually a sign of severe insect attack.*	Yes
17. Are there less than 20 % of trees affected by mistletoe? *Mistletoe is a parasite that invades trees and causes them to lose vigour. Where many trees in an area are affected it is likely to indicate that the area of vegetation is under severe stress.*	Yes
18. Are there logs and fallen timber on the ground? *Logs and dead material are essential habitat for smaller native organisms. But they can also be a harbour for pest animals.*	Yes
19. If scattered paddock trees are unfenced, are stock camps absent? *Bare ground, bare tree roots or the movement of soil all can indicate erosion which needs to be managed and controlled.*	N/A
20. If scattered paddock trees are unfenced, is evidence of stock ringbarking or rubbing absent?	N/A
21. Is the area free of herbicide, insecticide or fertiliser overspray from adjoining areas? *Herbicides and insecticides can kill native plants and small organisms. Fertiliser encourages exotic species by raising nutrient levels.*	Yes
22. Is the area free from the threat of salinity and / or high water tables?	Yes
Total number of 'yes' answers	18

Condition rating - native vegetation				
Number of 'yes' answers			**Vegetation condition rating**	**Need for management attention**
Remnant bushland	**Remnant grassland**	**Scattered paddock trees**		
14 +	9 +	12 +	Healthy	Maintain current management
9 - 13	6 - 8	8 - 11	Good	Needs some management attention
5 - 8	3 - 5	5 - 7	Fair	Needs a significant level of management attention
0 - 4	0 - 2	0 - 4	Poor	Urgent management necessary if you wish to retain area as stock shelter

7.3 Photopoint 3 (GR 265263 6197520 GDA 94)



Plot data not provided for this photo-point, as it is a regularly cleared power-line easement.

7.4 Photo-point 4 and Plot 4 data

Photopoint 4 and Plot 4 is a 6m x 60 m plot along an existing closed fire road – the photo-points and data aim to assist in continued assessment of track usage and effectiveness of the fence for track closure. Photo-points were taken at start of plot and at 10 metre lengths along the 60 metre plot line.

Photopoint 4. Looking towards fence across track at start of Plot 4 (GR 0265119 6197472 GDA 94)

Photopoint 4. Looking west along plot 4 from start of plot transect (GR 0265119 6197472 GDA 94)

Photopoint 4. Looking west along Plot 4 Transect at 10 metre point.

Photopoint 4. Looking west along Plot 4 Transect at 20 metre point.

Photopoint 4. Looking west along Plot 4 transect at 30 metre point

Photopoint 4. Looking west along Plot 4 transect at 40 metre point

Photopoint 4. Looking west along Plot 4 transect at 50 metre point

Photopoint 4. Looking west along Plot 4 transect at 60 metre point

Additional photographs from Plot 4 to assist with future monitoring assessments

Looking West at fence line across track.

Broken rock on side of track

Flowering plants at side of track

Site Value – plot data sheet

Start a new sheet for each zone.

Biometric

SITE NO 4 ZONE NO 56 RECORDERS Wyn Jones/Marg Turton

LOCATION DESCRIPTION: Southern Highlands Regional Shooting Complex DATE 18/10/2011

LAND TENURE NSW Govt. State Sporting Venues Authority LAND MANAGER Office of Communities (Sport and Recreation)

Vegetation formation (as per Keith 2004) Sydney Hinterland Dry Sclerophyll Forests

Vegetation class (as per Keith 2004) Dry Sclerophyll Forests

Vegetation class (on ground) Open Forest – *Eucalyptus sclerophylla/Corymbia gummifera/E.agglomerata*

Vegetation type (Biometric) Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin

Landscape (Mitchell 2002) __Nattai Plateau_____

CMA _____Hawkesbury-Nepean_____

Site Orientation: Aspect 57 Slope: 6

AMG (GPS datum GDA 94)	Benchmarks	1	2	3	4	5	6
Easting	0265119	10m	20m	30m	40	50	60
Northing	6197472						

Located along the centreline from the eastern boundary line of the plot. 6 x 60m plot centered in the road. Estimates for the whole plot given.

Number of native plant species	31				
Native over-storey cover (%) -use alternative method below if appropriate		40	20	30	10
Native mid-storey cover (%)		<5	0	0	0
Native ground cover – grasses (%)		0	0	0	0
Native ground cover – shrubs (%)		<1	<5	1	<5
Native ground cover – other (%)		<5	<5	<1	<5
Exotic plant cover (%)		0	0	0	0

(use cover abundance score for all percent figures and select mid-point of % range to enter into Biometric)

Plot 4

	Photo Point 4 and description
Looking North	0265119 6197472 Track – good bush each side
Looking East	0265119 6197472 Photopoint looking east from start of track transect towards fenced track entrance
Looking South	
Looking West	Photo taken every 10 metres along track transect – for 60 metres. Track – good bush each side

Site Value methodology prompts (for full details refer to Appendix 3 of *BioMetric* Operational Manual)

- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: The over-storey is the tallest woody stratum present (including emergents) above 1m. For example, in a woodland community the over-storey stratum is the tree layer and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum. The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration). The ground stratum contains all indigenous native vegetation below 1m in height. The ground stratum (grasses) refers to indigenous native vegetation of grasses (i.e. plants belonging to the family Poaceae).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other, and exotic): % Foliage Cover (FC) œ as defined in *BioMetric* Operational Manual
- Exotic plant cover: % Foliage Cover of all exotic species (i.e. all strata).
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration (≤5cm DBH, no height limits).

Cover abundance scale 1-7		
1	<5% - rare or few individuals	3 or less individuals
2	<5% - uncommon	More than 3 – sparsely scattered or localised
3	<5% - common	Consistent throughout plot
4a	<5% - very abundant	Many individuals throughout plot
4b	5% - 25%	
5	25% - 50%	
6	50% - 75%	
7	75% - 100%	

Plot Work Sheets - Plot 4

Native Trees (over-storey) Species list	**Regen (√)**	Native Lower Trees and Tall shrubs (mid – storey) species	Native Ground covers – Shrubs species	Native Ground cover – Grasses species	Native Ground cover – other (ferns, climbers) species	Exotic Plants Species List
Eucalyptus sclerophylla (3)	√ #	*Corymbia gummifera*(1)	*Gompholobium grandiflorum* (2)	*Entolasia stricta* (1)	*Phyllanthus hirtellus* (3)	
Corymbia gummifera (3)	√ #		*Bossiaea obcordata* (2)		*Patersonia sericea* (3)	
Eucalyptus agglomerata (3)	√ #		*Acacia myrtifolia* (2)		*Lomatia silaifolia* (2)	
			Grevillea speciosa (2)		*Dianella caerulea* (30	
			Acacia linifolia (1)		*Pomax umbellata* (1)	
			Xylomelum pyriforme (1)		*Dampiera purpurea* (1)	
			Daviesia ulicifolia (1)		*Bossiaea heterophylla* (2)	
			Lissanthe strigosa (2)		*Goodenia hederacea* (4b)	
					Lepidosperma laterale (4b)	
					Tetratheca thymifolia (1)	Foliage Cover (%)
					Hibbertia rufa (10)	Av. crown diameter (m)= av. foliage cover (%) = # trees = sample area (ha) =
					Gonocarpus teucrioides (1)	
					Lomandra obliqua (2)	
					Billardiera scandens (1)	# trees with hollows = 0 sample area (ha) =
					Lomandra glauca (1)	
					Platysace ericoides (2)	
					Lomandra confertifolia spp. rubiginosa (1)	Total length (m) of fallen logs (minimum 10cm diameter x 50 cm long)
					Boronia ledifolia (1)	
					Monotoca scoparia (2)	
Foliage Cover (%) 40		Foliage Cover (%) 1	Foliage Cover (%) 1	Foliage Cover (%) 1	Foliage Cover (%) 1	

Disturbance Data – Plot 4

Grazing	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Erosion	Intensity	Nil	Minor	Moderate	Severe	Very Severe	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Fire & Burning	Intensity	Nil	Light	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Clearing	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Cropping	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Logging	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Exotics and Noxious Weeds	Intensity	Nil	Very Low	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Feral sp.	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown

Habitat Features – Plot 4

Hollows under 5cm	Hollows 5-10cm	Hollows 11-20cm	Hollows >20cm
Few	Yes	No	No
Peeling Bark	Fissures	Cracks	Stick Nests
Yes	Yes	No	No
Soil Cracks	Rocky areas	Caves	Mud Nests
No	No	No	No
Fallen Hollow Logs	Fallen Timber	Leaf Litter	Bare patches
No	Yes	Yes	Yes
Mistletoe	Acacia Sp.	Termite Mounds	Casuarina Sp.
No	Yes	No	No
Dam	Creek	River	Dead Trees
No	No	No	No

Is there a presence of

Other Valuable Habitat Features			
	Yes/No & brief description condition		Yes/No & brief description condition
Breeding/ roosting sites	No. Track edges	Rock Outcrops/Formations	No. Track edges
Habitat Garden/Constructed water feature	No	Weedy vegetation used as habitat	No
Cultivated areas used by wildlife	No	Built structures/non-structural features used as habitat	No

CONDITION ASSESSMENT NATIVE VEGETATION – Plot 4

For native bushland and grassland sites and paddocks containing scattered shade trees

Site number or name: 4 **Monitoring date: 18/10/2011**	
Assessment questions	**Answer Yes, No or N/A**
23. Is the area fenced to manage stock access and grazing ? *Healthy bush should be rested for long periods to allow regeneration. To achieve this, it should be fenced off.*	**Yes** **partial**
24. Is there regeneration of native trees and shrubs, or if in grassland, regular germination of native herbs eg perennials such as lilies or orchids and annuals such as daisies? *Regeneration of trees and shrubs is necessary for the bush to maintain health, diversity and a range of habitats. An understorey of shrubs encourages small insect eating birds and other native animals.*	yes
25. Is there a diverse range of tree and shrub species present, eg more than 20 (coast), 15 (tablelands), 10 (western slopes and plains)? (Note: healthy river red gum forest may have only one tree and 5-10 shrub species present). *Diversity encourages a range of native animals and helps the bush withstand attacks of insects and other adverse conditions.*	No
26. If grassland, is there a diverse range of grasses and broad leaf herbs present?	No
27. Is there adequate ground cover, eg leaves, bark and twigs, or litter (dead grasses)? *Ground cover indicates whether the area is being disturbed by stock and is a measure of tree canopy density and the domination of exotic grasses and weeds.*	No
28. Are mosses or lichens on rocks, fallen branches and the ground surface, or are these species, along with liverworts, forming a crust on bare soil?	No
29. Are weeds uncommon, sparsely scattered, absent, or mainly around edges of the area? *The understorey may have exotic weeds present. Too many are undesirable and you may need a management plan for their control. Weeds compete with native plants for light, space, water and nutrients.*	Yes
30. Is there a very low incidence of pest animals, eg foxes and rabbits? *Remnant bush can be a refuge for pest animals as well as natives. The feral animals should be controlled.*	Yes
31. Is the patch shape a block or part of a corridor more than 30 metres wide rather than a thin strip? *Blocks of native vegetation have less edge area than strips, so they are less influenced by changes in levels of weeds, predators, noise and climatic effects.*	Yes
32. Is the area greater than 1 ha (coast), 5 ha (tablelands), 10 ha (western slopes), 20 ha (plains), 50 ha (Western Division)?	Yes
33. Is the remnant linked to other remnants by corridors, eg. roadside vegetation, or scattered trees no more than 50 m apart ? *Corridors provide shelter and pathways for native organisms (other than birds) to*	Yes

move over the landscape for feeding, breeding, roosting and expanding territory.	
34. Is there a mix of tree ages present, ie saplings through to old growth with hollows ? *A range of ages and conditions means the bush is regenerating itself and each stage of growth is suitable habitat for native organisms.*	No
35. If trees are present is an understorey also present? *An understorey of shrubs encourages small insect eating birds and other native animals.*	**Yes**
36. Is the understorey mostly comprised of native shrubs and / or grasses and broad leaf herbs?	Yes
37. Area there standing trees (alive or dead) with hollows, present in the remnant or paddock ? *Dead trees with hollows are essential for roosting and nesting of a large range of native birds such as parrots and of bats.*	Yes
38. Are the trees mainly healthy, with little or no dieback? *Dieback is apparent if there are bare twigs at the outer part of the tree canopy. It is usually a sign of severe insect attack.*	Yes
39. Are there less than 20 % of trees affected by mistletoe? *Mistletoe is a parasite that invades trees and causes them to lose vigour. Where many trees in an area are affected it is likely to indicate that the area of vegetation is under severe stress.*	Yes
40. Are there logs and fallen timber on the ground? *Logs and dead material are essential habitat for smaller native organisms. But they can also be a harbour for pest animals.*	Yes
41. If scattered paddock trees are unfenced, are stock camps absent? *Bare ground, bare tree roots or the movement of soil all can indicate erosion which needs to be managed and controlled.*	N/a
42. If scattered paddock trees are unfenced, is evidence of stock ringbarking or rubbing absent?	N/a
43. Is the area free of herbicide, insecticide or fertiliser overspray from adjoining areas? *Herbicides and insecticides can kill native plants and small organisms. Fertiliser encourages exotic species by raising nutrient levels.*	Yes
44. Is the area free from the threat of salinity and / or high water tables?	Yes
Total number of 'yes' answers	15

Condition rating - native vegetation				
Number of 'yes' answers			**Vegetation condition rating**	**Need for management attention**
Remnant bushland	**Remnant grassland**	**Scattered paddock trees**		
14 +	9 +	12 +	Healthy	Maintain current management
9 - 13	6 - 8	8 - 11	Good	Needs some management attention
5 - 8	3 - 5	5 - 7	Fair	Needs a significant level of management attention
0 - 4	0 - 2	0 - 4	Poor	Urgent management necessary if you wish to retain area as stock shelter

7.5 Photo-point 5 and Plot 5 data

Photo-point 5

Looking North from N/W plot marker
(GR: 264843 6200465 GDA 94)

Photo-point 5

Looking South from N/W plot marker
(GR: 264843 6200465 GDA 94)

Photo-point 5

Looking East from N/W plot marker
(GR: 264843 6200465 GDA 94)

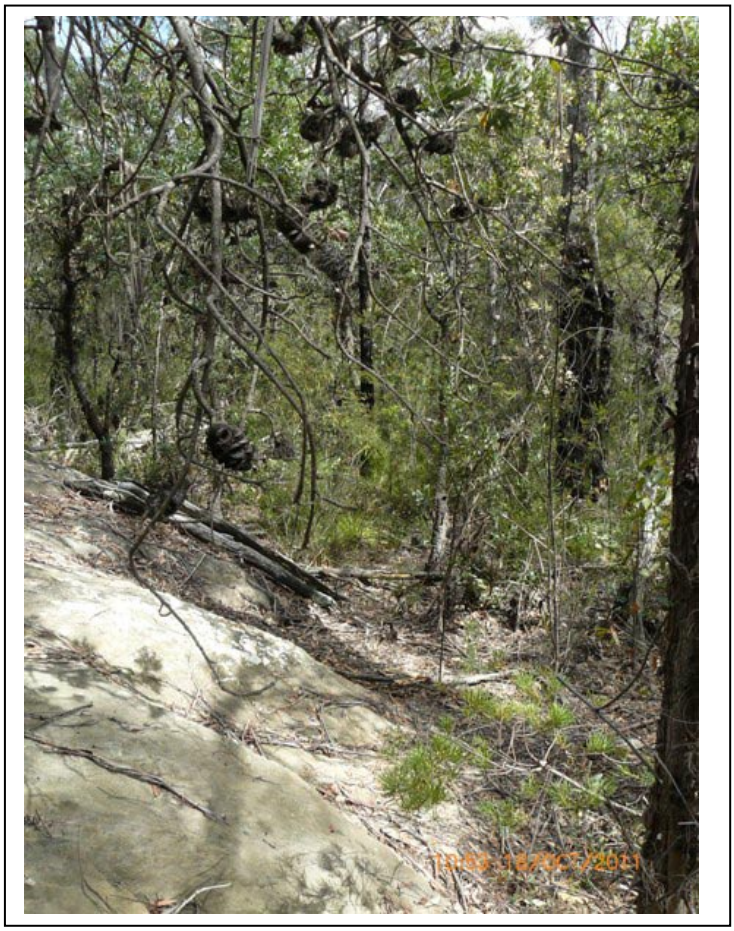


Photo-point 5

Looking West from N/W plot marker
(GR: 264843 6200465 GDA 94)

Additional photographs from Plot 5 to assist with future monitoring assessments

Overview of Plot 5 from rock shelf.

Large ant mound within Plot 5

North-west marker peg for Plot 5.

Crowea exalta growing in Plot 5

Cleared area above detention basin.

Site Value – plot data sheet

Start a new sheet for each zone. HILLTOP RIFLE RANGE MONITORING

Biometric

SITE NO PLOT 5 ZONE NO 56 RECORDERS Wyn Jones

LOCATION DESCRIPTION: Southern Highlands Regional Shooting Complex DATE 18/10/201

LAND TENURE NSW Govt. State Sporting Venues Authority LAND MANAGER Office of Communities (Sport and Recreation)

Vegetation formation (as per Keith 2004) Sydney Hinterland Dry Sclerophyll Forest

Vegetation class (as per Keith 2004) Dry Sclerophyll Forest

Vegetation class (on ground) Open Forest *Eucalyptus piperita – Corymbia gummifera*

Vegetation type (Biometric) Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin

Landscape (Mitchell 2002) __Nattai Plateau_____

CMA __Hawkesbury-Nepean_____
ASPECT 290 SLOPE 15

AMG (GPS datum GDA 94)	Benchmarks	1 NW	2 SW	3 SE	4 NE
Easting		264843	264846	264866	264867
Northing		6200465	6200446	6200447	6200468

20 x 20m plot Benchmarks are located in each compass quadrant of the plot

Number of native plant species					
Native over-storey cover (%) -use alternative method below if appropriate		35	10	20	50
Native mid-storey cover (%)		10	15	10	30
Native ground cover – grasses (%)		0	0	0	0
Native ground cover – shrubs (%)		10	10	5	10
Native ground cover – other (%)		5	1	5	1
Exotic plant cover (%)		0	0	0	0

(use cover abundance score for all percent figures and select mid-point of % range to enter into Biometric)0

Larger sampling area (20m x 50m plot, or whole of zone)

Number of trees with hollows - use alternative method below if appropriate	14				
Over-storey regeneration (proportion of over-storey spp)	100%				
Total length of fallen logs (m)	30				

	Photo Point Numbers and description
PP5 Looking North	General habitat, Good bush. deep litter layer. (GR: 264843 6200465 GDA 94)
PP5 Looking East	General habitat, deep litter layer. Good bush. Some rock shelving. (GR: 264843 6200465 GDA 94)
PP5 Looking South	General habitat, deep litter layer. Good bush. (GR: 264843 6200465 GDA 94)
PP5 Looking West	General habitat, deep litter layer. Good Bush. Large rock shelf. (GR: 264843 6200465 GDA 94)

Site Value methodology prompts (for full details refer to Appendix 3 of *BioMetric* Operational Manual)

- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: The over-storey is the tallest woody stratum present (including emergents) above 1m. For example, in a woodland community the over-storey stratum is the tree layer and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum. The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration). The ground stratum contains all indigenous native vegetation below 1m in height. The ground stratum (grasses) refers to indigenous native vegetation of grasses (i.e. plants belonging to the family Poaceae).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other, and exotic): % Foliage Cover (FC) œ as defined in *BioMetric* Operational Manual
- Exotic plant cover: % Foliage Cover of all exotic species (i.e. all strata).
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration (≤5cm DBH, no height limits).

Cover abundance scale 1-7		
1	<5% - rare or few individuals	3 or less individuals
2	<5% - uncommon	More than 3 – sparsely scattered or localised
3	<5% - common	Consistent throughout plot
4a	<5% - very abundant	Many individuals throughout plot
4b	5% - 25%	
5	25% - 50%	
6	50% - 75%	
7	75% - 100%	

Plot Work Sheet **PLOT 5** **18/10/2011**

Native Trees (over-storey) Species list	**Regen (□)**	Native Lower Trees and Tall shrubs (mid – storey) species	Native Ground covers – Shrubs species	Native Ground cover – Grasses species	Native Ground cover – other (ferns, climbers) species	Exotic Plants Species List
Eucalyptus piperita (5)		*Banksia serrata* (4b)	*Acacia terminalis* (3)	*Entolasia stricta* (1)	*Lomandra confertifolia ssp rubiginosa* (4b)	
Corymbia gummifera (4b)	□	*Corymbia gummifera* (1)	*Acacia linifolia* (4b)		*Lomatia silaifolia* (4b)	
Eucalyptus sieberi (2)			*Banksia spinulosa ssp. spinulosa* (2)		*Patersonia glabrata* (5)	
			Daviesia corymbosa (2)		*Cassytha glabella* (3)	
			Hakea gibbosa (2)		*Phyllanthus hirtellus* (2)	
			Hakea dactylioides (2)		*Tetratheca thymifolia* (4b)	
			Bossiaea obcordata (4b)		*Lissanthe strigosa* (2)	
			Acacia myrtifolia (4b)		*Goodenia hederacaea* (2)	
			Comesperma ericifolium (2)		*Poranthera linifolia* (1)	
			Pimelea linifolia (2)		*Hovea linearis* (2)	
			Pultenaea hispidula (3)		*Hibbertia rufa* (1)	
			Crowea exalta (2)		*Hardenbergia violacea* (1)	Foliage Cover (%)
			Persoonia levis (1)		*Xanthosia pilosa* (2)	Av. crown diameter (m)= av. foliage cover (%) = # trees = ≥50 sample area (ha) =
			Monotoca scoparia (1)		*Pteridium esculentum* (1)	
			Gompholobium grandiflorum (1)		*Mirbelia rubiifolia* (1)	
			Persoonia mollis (1)		*Dampiera purpurea* (1)	
			Pomaderris ligustrina (1)		*Pomax umbellata* (1)	
			Telopea speciosissima (1)		*Lomandra obliqua* (2)	
			Dampiera stricta (1)		*Lepidosperma laterale* (2)	
			Grevillea buxifolia (1)		*Gonocarpus teucrioides* (2)	
			Baeckea linifolia (1)			# trees with hollows = ≥ 15 sample area (ha) = 20m x 20m plot
			Dillwynia speciosa (2)			
			Xylomelum pyriforme (2)			
Foliage Cover (%) 40		Foliage Cover (%) 15	Foliage Cover (%) 25	Foliage Cover (%) 5	Foliage Cover (%) 40	

Plot 5

Grazing	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Erosion	Intensity	Nil	Minor	Moderate	Severe	Very Severe	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Fire & Burning	Intensity	Nil	Light	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Clearing	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Cropping	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Logging	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Exotics and Noxious Weeds	Intensity	Nil	Very Low	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Feral sp.	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown

Habitat Features – Plot 5

Hollows under 5cm	Hollows 5-10cm	Hollows 11-20cm	Hollows >20cm
Few	Yes	Yes	Yes
Peeling Bark	Fissures	Cracks	Stick Nests
Yes	Yes	Yes	No
Soil Cracks	Rocky areas	Caves	Mud Nests
No	Yes	Very small areas under overhangs	No
Fallen Hollow Logs	Fallen Timber	Leaf Litter	Bare patches
Yes	Yes	Yes	Yes
Mistletoe	Acacia Sp.	Termite Mounds	Casuarina Sp.
No	Yes	Yes	No
Dam	Creek	River	Dead Trees
No	No Minor drainage line	No	Yes

Is there a presence of

Other Valuable Habitat Features			
	Yes/No & brief description condition		Yes/No & brief description condition
Breeding/ roosting sites	Yes, in mature trees	Rock Outcrops/Formations	Yes, Rock outcrops and exfoliating rock
Habitat Garden/Constructed water feature	N/a	Weedy vegetation used as habitat	N/a
Cultivated areas used by wildlife	N/a	Built structures/non-structural features used as habitat	N/a

CONDITION ASSESSMENT NATIVE VEGETATION – PLOT 5

For native bushland and grassland sites and paddocks containing scattered shade trees

Site number or name: Plot 5 **Monitoring date: 18 October 2011**	
Assessment questions	**Answer Yes, No or N/A**
45. Is the area fenced to manage stock access and grazing ? *Healthy bush should be rested for long periods to allow regeneration. To achieve this, it should be fenced off.*	**partially**
46. Is there regeneration of native trees and shrubs, or if in grassland, regular germination of native herbs eg perennials such as lilies or orchids and annuals such as daisies? *Regeneration of trees and shrubs is necessary for the bush to maintain health, diversity and a range of habitats. An understorey of shrubs encourages small insect eating birds and other native animals.*	Yes
47. Is there a diverse range of tree and shrub species present, eg more than 20 (coast), 15 (tablelands), 10 (western slopes and plains)? (Note: healthy river red gum forest may have only one tree and 5-10 shrub species present). *Diversity encourages a range of native animals and helps the bush withstand attacks of insects and other adverse conditions.*	Yes
48. If grassland, is there a diverse range of grasses and broad leaf herbs present?	N/A
49. Is there adequate ground cover, eg leaves, bark and twigs, or litter (dead grasses)? *Ground cover indicates whether the area is being disturbed by stock and is a measure of tree canopy density and the domination of exotic grasses and weeds.*	Yes
50. Are mosses or lichens on rocks, fallen branches and the ground surface, or are these species, along with liverworts, forming a crust on bare soil?	Yes
51. Are weeds uncommon, sparsely scattered, absent, or mainly around edges of the area? *The understorey may have exotic weeds present. Too many are undesirable and you may need a management plan for their control. Weeds compete with native plants for light, space, water and nutrients.*	Yes
52. Is there a very low incidence of pest animals, eg foxes and rabbits? *Remnant bush can be a refuge for pest animals as well as natives. The feral animals should be controlled.*	Yes
53. Is the patch shape a block or part of a corridor more than 30 metres wide rather than a thin strip? *Blocks of native vegetation have less edge area than strips, so they are less influenced by changes in levels of weeds, predators, noise and climatic effects.*	Yes
54. Is the area greater than 1 ha (coast), 5 ha (tablelands), 10 ha (western	Yes

slopes), 20 ha (plains), 50 ha (Western Division)?	
55. Is the remnant linked to other remnants by corridors, eg. roadside vegetation, or scattered trees no more than 50 m apart ? *Corridors provide shelter and pathways for native organisms (other than birds) to move over the landscape for feeding, breeding, roosting and expanding territory*.	Yes
56. Is there a mix of tree ages present, ie saplings through to old growth with hollows ? *A range of ages and conditions means the bush is regenerating itself and each stage of growth is suitable habitat for native organisms.*	Yes
57. If trees are present is an understorey also present? *An understorey of shrubs encourages small insect eating birds and other native animals.*	**Yes**
58. Is the understorey mostly comprised of native shrubs and / or grasses and broad leaf herbs?	Yes Native shrubs
59. Area there standing trees (alive or dead) with hollows, present in the remnant or paddock ? *Dead trees with hollows are essential for roosting and nesting of a large range of native birds such as parrots and of bats.*	Yes
60. Are the trees mainly healthy, with little or no dieback? *Dieback is apparent if there are bare twigs at the outer part of the tree canopy. It is usually a sign of severe insect attack.*	Yes
61. Are there less than 20 % of trees affected by mistletoe? *Mistletoe is a parasite that invades trees and causes them to lose vigour. Where many trees in an area are affected it is likely to indicate that the area of vegetation is under severe stress.*	Yes
62. Are there logs and fallen timber on the ground? *Logs and dead material are essential habitat for smaller native organisms. But they can also be a harbour for pest animals.*	Yes
63. If scattered paddock trees are unfenced, are stock camps absent? *Bare ground, bare tree roots or the movement of soil all can indicate erosion which needs to be managed and controlled.*	Yes
64. If scattered paddock trees are unfenced, is evidence of stock ringbarking or rubbing absent?	N/A
65. Is the area free of herbicide, insecticide or fertiliser overspray from adjoining areas? *Herbicides and insecticides can kill native plants and small organisms. Fertiliser encourages exotic species by raising nutrient levels.*	Yes
66. Is the area free from the threat of salinity and / or high water tables?	N/A

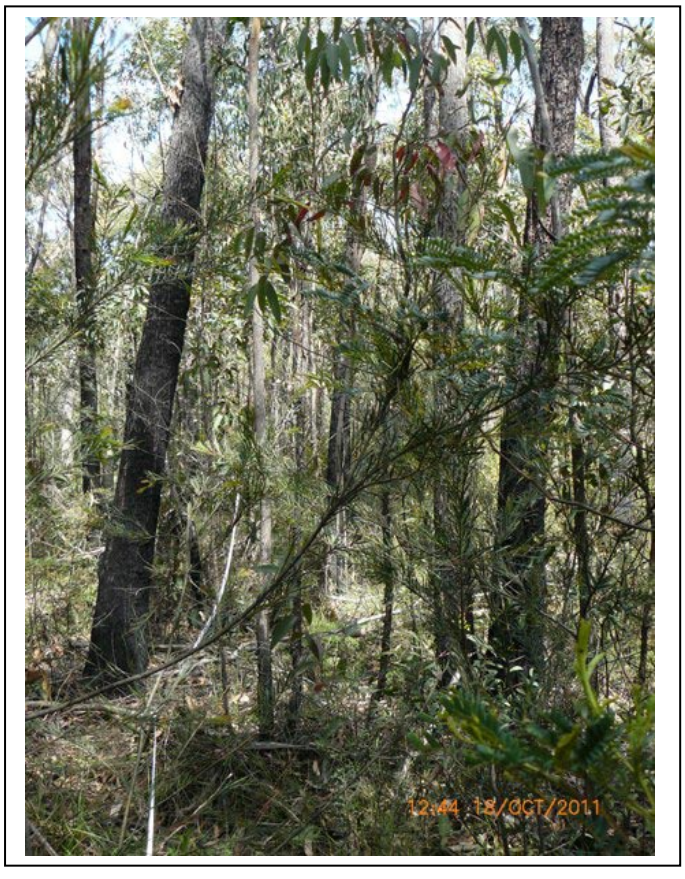
Total number of 'yes' answers	18

Condition rating - native vegetation

Number of 'yes' answers			**Vegetation condition rating**	**Need for management attention**
Remnant bushland	**Remnant grassland**	**Scattered paddock trees**		
14 +	9 +	12 +	Healthy	Maintain current management
9 - 13	6 - 8	8 - 11	Good	Needs some management attention
5 - 8	3 - 5	5 - 7	Fair	Needs a significant level of management attention
0 - 4	0 - 2	0 - 4	Poor	Urgent management necessary if you wish to retain area as stock shelter

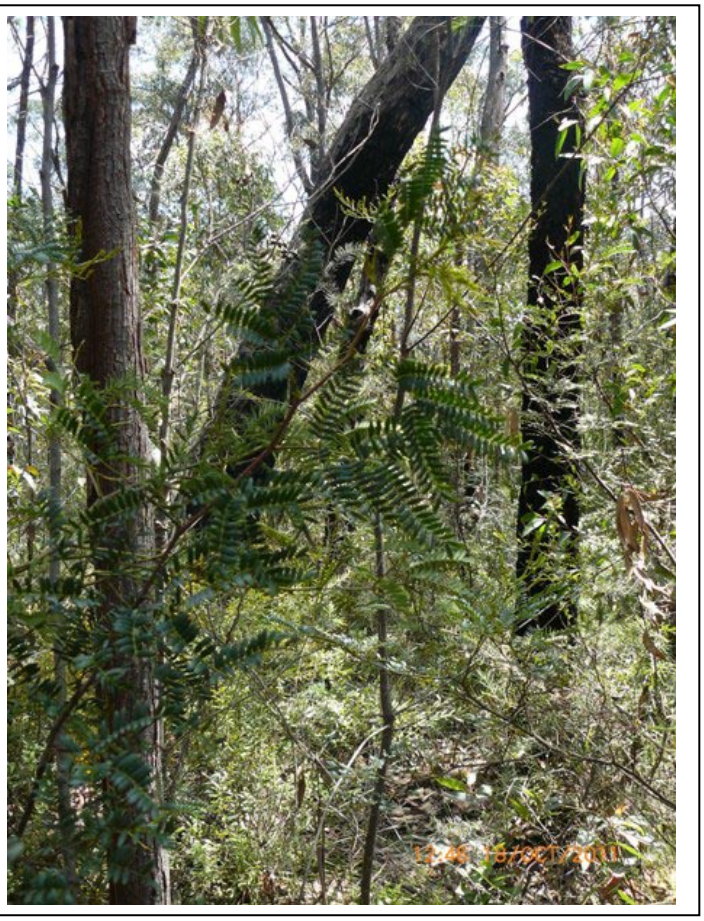
7.6 Photo-point 6 and Plot 6 data

Photopoint 6. Looking North from N/E plot marker (GR: 265435 6200643 GDA 94)



Photopoint 6.
Looking South from N/E plot marker
(GR: 265435 6200643 GDA 94)

Photopoint 6. Looking East from N/E plot marker (GR: 265435 6200643 GDA 94)



Photopoint 6.
Looking West from N/E plot marker
(GR: 265435 6200643 GDA 94)

Additional photographs from Plot 6 to assist with future monitoring assessments

Looking towards Plot 6 from road

Plot 6 N/E marker adjacent to existing peg (GR: 265435 6200643 GDA 94)

Site Value – plot data sheet

Start a new sheet for each zone. HILLTOP RIFLE RANGE MONITORING

Biometric

SITE NO PLOT 6 ZONE NO 56 RECORDERS Wyn Jones/Margaret Turton

LOCATION DESCRIPTION: Southern Highlands Regional Shooting Complex DATE 18/10/201

LAND TENURE NSW Govt. State Sporting Venues LAND MANAGER Office of Communities (Sport and Recreation)

Vegetation formation (as per Keith 2004) Sydney Hinterland Dry Sclerophyll Forest

Vegetation class (as per Keith 2004) Dry Sclerophyll Forests

Vegetation class (on ground) Open Forest *Eucalyptus piperita – Corymbia gummifera - Eucalyptus sieberi*

Vegetation type (Biometric) Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin

Landscape (Mitchell 2002) __Nattai Plateau_____

CMA ____Hawkesbury-Nepean_____

SITE ORIENTATION: ASPECT: 290° SLOPE: 1

AMG (GPS datum_AGD 94__)	Benchmarks	1 NW	2 SW	3 SE	4 NE
Easting		265416	265414	265433	265435
Northing		6200646	6200626	6200624	6200643

20 x 20m plot

Number of native plant species	47				
Native over-storey cover (%) -use alternative method below if appropriate		50	50	40	40
Native mid-storey cover (%)		25	20	30	50
Native ground cover – grasses (%)		0	0	0	0
Native ground cover – shrubs (%)		20	10	20	40
Native ground cover – other (%)		40	50	60	40
Exotic plant cover (%)		0	0	0	0

(use cover abundance score for all percent figures and select mid-point of % range to enter into Biometric)0

	Photo Point 6 and description
Looking North	Along fenceline and road verge. Bushland (GR: 265435 6200643 GDA 94)
Looking East	Across to road (GR: 265435 6200643 GDA 94)
Looking South	Bush (GR: 265435 6200643 GDA 94)
Looking West	Bush (GR: 265435 6200643 GDA 94)

Site Value methodology prompts (for full details refer to Appendix 3 of *BioMetric* Operational Manual)

- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: The over-storey is the tallest woody stratum present (including emergents) above 1m. For example, in a woodland community the over-storey stratum is the tree layer and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum. The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration). The ground stratum contains all indigenous native vegetation below 1m in height. The ground stratum (grasses) refers to indigenous native vegetation of grasses (i.e. plants belonging to the family Poaceae).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other, and exotic): % Foliage Cover (FC) œ as defined in *BioMetric* Operational Manual
- Exotic plant cover: % Foliage Cover of all exotic species (i.e. all strata).
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration (≤5cm DBH, no height limits).

Cover abundance scale 1-7		
1	<5% - rare or few individuals	3 or less individuals
2	<5% - uncommon	More than 3 – sparsely scattered or localised
3	<5% - common	Consistent throughout plot
4a	<5% - very abundant	Many individuals throughout plot
4b	5% - 25%	
5	25% - 50%	
6	50% - 75%	
7	75% - 100%	

Plot Work Sheet **PLOT 6** **18/10/2011**

Native Trees (over-storey) Species list	**Regen (√)**	Native Lower Trees and Tall shrubs (mid –storey) species	Native Ground covers – Shrubs species	Native Ground cover – Grasses species	Native Ground cover – other (ferns, climbers) species	Exotic Plants Species List
Eucalyptus piperita (5)	√	*Eucalyptus piperita* (4b)	*Acacia terminalis* (3)	*Entolasia marginata* (2)	*Lomandra confertifolia ssp rubiginosa* (4b)	
Corymbia gummifera (4b)	√	*Corymbia gummifera* (5)	*Acacia linifolia* (4b)	*Entolasia stricta* (2)	*Lomatia silaifolia* (4b)	
Eucalyptus sieberi(2)	√	*Eucalyptus sieberi*(2)	*Banksia spinulosa ssp. spinulosa* (4b)		*Patersonia sericea* (5)	
Eucalyptus oblonga (2)			*Daviesia corybosa* (4b_		*Cassytha glabella* (3)	
			Grevillea sphacelata (4b)		*Phyllanthus hirtellus* (2)	
			Hakea dactyloides (2)		*Tetratheca thymifolia* (4b)	
			Bossiaea obcordata (4b)		*Lissanthe strigose* (2)	
			Acacia myrtifolia (4b)		*Goodenia hederacaea* (2)	
			Comesperma ericinum (2)		*Poranthera linifolia* (1)	
			Pimelea linifolia (2)		*Hovea linearis* (2)	
			Pultenaea hispidula (3)		*Hibbertia rufa* (1)	
			Pultenaea scabra (1)		*Hardenbergia violacea* (1)	Foliage Cover (%)
			Persoonia levis (1)		*Xanthosia pilosa* (1)	Av. crown diameter (m)= 2
			Monotoca scoparia (1)		*Pteridium esculentum* (1)	av. foliage cover (%) = 80
			Gompholobium grandiflorum (1)		*Mirbelia rubifolia* (1)	# trees = ≥50
						sample area (ha) =
			Dampiera stricta (1)		*Dampiera purpurea* (1)	# trees with hollows = ≥ 10
			Grevillea buxifolia (1)		*Pomax umbellata* (1)	sample area (ha) =
			Baeckea linifolia (1)		*Lomanddra obliqua* (2)	
			Dillwynia sericea (1)		*Lepidosperma laterale* (2)	
			Xylomelum pyriforme (1)		*Gonocarpus teucrioides* (2)	
			Hakea gibbosa (1)			
Foliage Cover (%) 40		Foliage Cover (%) 15	Foliage Cover (%) 25	Foliage Cover (%) 5	Foliage Cover (%) 40	

Grazing	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Erosion	Intensity	Nil	Minor	Moderate	Severe	Very Severe	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Fire & Burning	Intensity	Nil	Light	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Clearing	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Cropping	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Logging	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Exotics and Noxious Weeds	Intensity	Nil	Very Low	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Feral sp.	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown

Habitat Features – Plot 6

Hollows under 5cm	Hollows 5-10cm	Hollows 11-20cm	Hollows >20cm
Yes	Yes	Yes	Yes
Peeling Bark	Fissures	Cracks	Stick Nests
Yes	Yes	Yes	No
Soil Cracks	Rocky areas	Caves	Mud Nests
No	No	No	No
Fallen Hollow Logs	Fallen Timber	Leaf Litter	Bare patches
Yes	Yes	Yes	No
Mistletoe	Acacia Sp.	Termite Mounds	Casuarina Sp.
No	Yes	No	No
Dam	Creek	River	Dead Trees
No	No	No	Yes

Is there a presence of

Other Valuable Habitat Features			
	Yes/No & brief description condition		Yes/No & brief description condition
Breeding/ roosting sites	Yes, trees and hollows	Rock Outcrops/Formations	No
Habitat Garden/Constructed water feature	No	Weedy vegetation used as habitat	No
Cultivated areas used by wildlife	No	Built structures/non-structural features used as habitat	No

CONDITION ASSESSMENT NATIVE VEGETATION – Plot 6

For native bushland and grassland sites and paddocks containing scattered shade trees

Site number or name: 6 **Monitoring date: 18/10/2011**	
Assessment questions	**Answer Yes, No or N/A**
67. Is the area fenced to manage stock access and grazing ? *Healthy bush should be rested for long periods to allow regeneration. To achieve this, it should be fenced off.*	**Yes** **partial**
68. Is there regeneration of native trees and shrubs, or if in grassland, regular germination of native herbs eg perennials such as lilies or orchids and annuals such as daisies? *Regeneration of trees and shrubs is necessary for the bush to maintain health, diversity and a range of habitats. An understorey of shrubs encourages small insect eating birds and other native animals.*	Yes
69. Is there a diverse range of tree and shrub species present, eg more than 20 (coast), 15 (tablelands), 10 (western slopes and plains)? (Note: healthy river red gum forest may have only one tree and 5-10 shrub species present). *Diversity encourages a range of native animals and helps the bush withstand attacks of insects and other adverse conditions.*	Yes
70. If grassland, is there a diverse range of grasses and broad leaf herbs present?	n/a
71. Is there adequate ground cover, eg leaves, bark and twigs, or litter (dead grasses)? *Ground cover indicates whether the area is being disturbed by stock and is a measure of tree canopy density and the domination of exotic grasses and weeds.*	Yes
72. Are mosses or lichens on rocks, fallen branches and the ground surface, or are these species, along with liverworts, forming a crust on bare soil?	No
73. Are weeds uncommon, sparsely scattered, absent, or mainly around edges of the area? *The understorey may have exotic weeds present. Too many are undesirable and you may need a management plan for their control. Weeds compete with native plants for light, space, water and nutrients.*	Yes
74. Is there a very low incidence of pest animals, eg foxes and rabbits? *Remnant bush can be a refuge for pest animals as well as natives. The feral animals should be controlled.*	Yes
75. Is the patch shape a block or part of a corridor more than 30 metres wide rather than a thin strip? *Blocks of native vegetation have less edge area than strips, so they are less influenced by changes in levels of weeds, predators, noise and climatic effects.*	Yes
76. Is the area greater than 1 ha (coast), 5 ha (tablelands), 10 ha (western slopes), 20 ha (plains), 50 ha (Western Division)?	Yes
77. Is the remnant linked to other remnants by corridors, eg. roadside vegetation, or scattered trees no more than 50 m apart ? *Corridors provide shelter and pathways for native organisms (other than birds) to*	Yes

move over the landscape for feeding, breeding, roosting and expanding territory.	
78. Is there a mix of tree ages present, ie saplings through to old growth with hollows ? *A range of ages and conditions means the bush is regenerating itself and each stage of growth is suitable habitat for native organisms.*	Yes
79. If trees are present is an understorey also present? *An understorey of shrubs encourages small insect eating birds and other native animals.*	Yes
80. Is the understorey mostly comprised of native shrubs and / or grasses and broad leaf herbs?	Yes
81. Area there standing trees (alive or dead) with hollows, present in the remnant or paddock ? *Dead trees with hollows are essential for roosting and nesting of a large range of native birds such as parrots and of bats.*	Yes
82. Are the trees mainly healthy, with little or no dieback? *Dieback is apparent if there are bare twigs at the outer part of the tree canopy. It is usually a sign of severe insect attack.*	Yes
83. Are there less than 20 % of trees affected by mistletoe? *Mistletoe is a parasite that invades trees and causes them to lose vigour. Where many trees in an area are affected it is likely to indicate that the area of vegetation is under severe stress.*	Yes
84. Are there logs and fallen timber on the ground? *Logs and dead material are essential habitat for smaller native organisms. But they can also be a harbour for pest animals.*	Yes
85. If scattered paddock trees are unfenced, are stock camps absent? *Bare ground, bare tree roots or the movement of soil all can indicate erosion which needs to be managed and controlled.*	n/a
86. If scattered paddock trees are unfenced, is evidence of stock ringbarking or rubbing absent?	n/a
87. Is the area free of herbicide, insecticide or fertiliser overspray from adjoining areas? *Herbicides and insecticides can kill native plants and small organisms. Fertiliser encourages exotic species by raising nutrient levels.*	Yes
88. Is the area free from the threat of salinity and / or high water tables?	Yes
Total number of 'yes' answers	18

Condition rating - native vegetation				
Number of 'yes' answers			**Vegetation condition rating**	**Need for management attention**
Remnant bushland	**Remnant grassland**	**Scattered paddock trees**		
14 +	9 +	12 +	Healthy	Maintain current management
9 - 13	6 - 8	8 - 11	Good	Needs some management attention
5 - 8	3 - 5	5 - 7	Fair	Needs a significant level of management attention
0 - 4	0 - 2	0 - 4	Poor	Urgent management necessary if you wish to retain area as stock shelter

7.7 Photo-point 7 and Plot 7 data

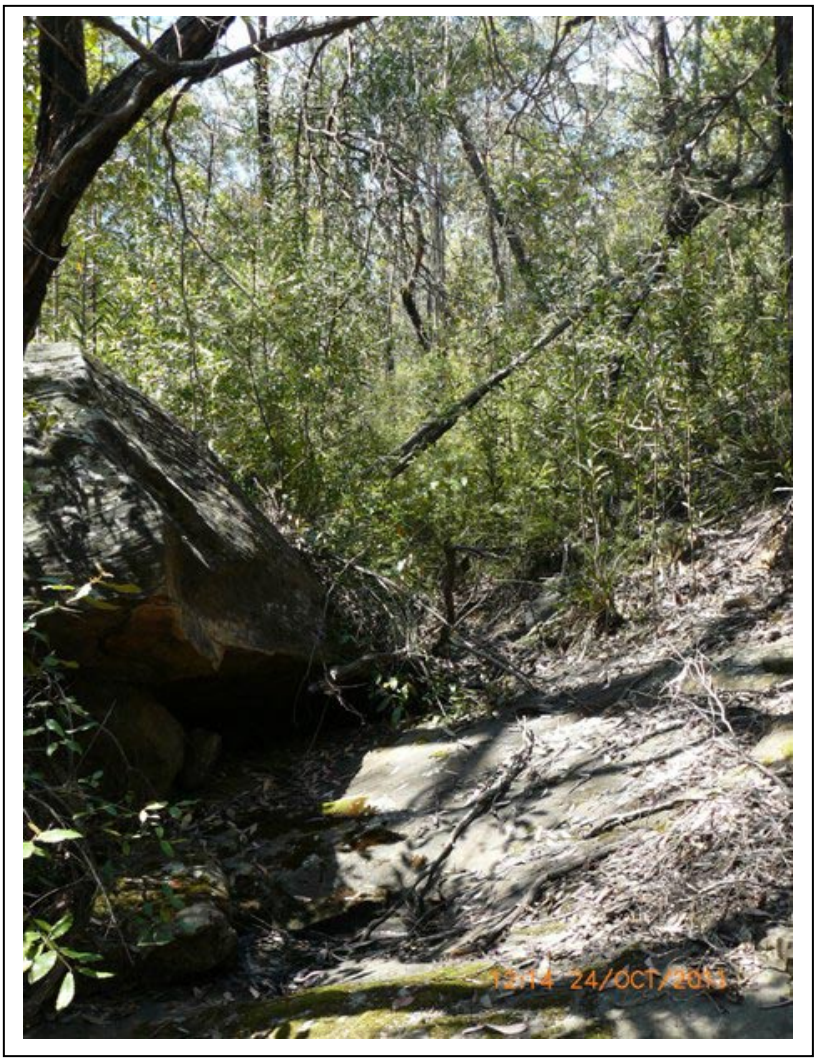
Photopoint 7. Looking North from NW plot marker (GR 265680 6199995 GDA 94)

Photopoint 7. Looking South from NW plot marker (GR 265680 6199995 GDA 94)

Photopoint 7. Looking East from NW plot marker (GR 265680 6199995 GDA 94)

Photopoint 7. Looking West from NW plot marker (GR 265680 6199995 GDA 94)

Additional photographs from Plot 7 to assist with future monitoring assessments



Rocky Creekline – note pothole in creek

Site Value – plot data sheet

Start a new sheet for each zone. HILLTOP RIFLE RANGE MONITORING

Biometric

SITE NO PLOT 7 ZONE NO 56 RECORDERS Wyn Jones

LOCATION DESCRIPTION _ Hilltop Rifle Range / Bargo Conservation Area_____ DATE 24/10/201

LAND TENURE NSW Govt. State Sporting Venues Authority. LAND MANAGER Office of Communities (Sport and Recreation)

Vegetation formation (as per Keith 2004) Sydney Hinterland Dry Sclerophyll Forests

Vegetation class (as per Keith 2004) Dry Sclerophyll Forests

Vegetation class (on ground) Open Forest: *Eucalyptus piperita – Corymbia gummifera - Eucalyptus cypellocarpa –Eucalyptus punctata – Eucalyptus globoidea*

Vegetation type (Biometric) Sydney Peppermint-White Stringybark moist shrubby forest on elevated ridges – Sydney Basin.

Landscape (Mitchell 2002) ___Nattai Plateau_____

CMA _Hawkesbury-Nepean_____SITE PHYSICAL ORIENTATION: ASPECT: 270˚ SLOPE: 3˚

AMG (GPS datum: GDA 94)	Benchmarks	1 NW	2 SW	3 SE	4 NE
Easting		265680	265677	265696	265699
Northing		6199995	6199977	6199975	6199992

20 x 20m plot

Number of native plant species					
Native over-storey cover (%) -use alternative method below if appropriate		20	50	10	10
Native mid-storey cover (%)		40	0	20	0
Native ground cover – grasses (%)		0	0	1	0
Native ground cover – shrubs (%)		20	60	50	50
Native ground cover – other (%)		5	20	10	10
Exotic plant cover (%)		0	0	0	0

(use cover abundance score for all percent figures and select mid-point of % range to enter into Biometric)0

	Photo Point 7 and description
Looking North	From N/W corner of plot. GR: 265680 6199995 Good bush. Looking upslope.
Looking East	From N/W corner of plot. GR: 265680 6199995 Good bush. Looking across slope.
Looking South	From N/W corner of plot. GR: 265680 6199995 Good bush. Across minor creekline.
Looking West	From N/W corner of plot. GR: 265680 6199995 Good bush. Looking across slope.

Site Value methodology prompts (for full details refer to Appendix 3 of *BioMetric* Operational Manual)

- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: The over-storey is the tallest woody stratum present (including emergents) above 1m. For example, in a woodland community the over-storey stratum is the tree layer and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum. The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration). The ground stratum contains all indigenous native vegetation below 1m in height. The ground stratum (grasses) refers to indigenous native vegetation of grasses (i.e. plants belonging to the family Poaceae).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other, and exotic): % Foliage Cover (FC) œ as defined in *BioMetric* Operational Manual
- Exotic plant cover: % Foliage Cover of all exotic species (i.e. all strata).
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration (≤5cm DBH, no height limits).

Cover abundance scale 1-7		
1	<5% - rare or few individuals	3 or less individuals
2	<5% - uncommon	More than 3 – sparsely scattered or localised
3	<5% - common	Consistent throughout plot
4a	<5% - very abundant	Many individuals throughout plot
4b	5% - 25%	
5	25% - 50%	
6	50% - 75%	
7	75% - 100%	

Plot Work Sheet **PLOT 7** **24/10/2011**

Native Trees (over-storey) Species list	**Regen (√)**	Native Lower Trees and Tall shrubs (mid – storey) species	Native Ground covers – Shrubs species	Native Ground cover – Grasses species	Native Ground cover – other (ferns, climbers) species	Exotic Plants Species List
Corymbia gummifera (1)	√	*Ceratopetalum gummiferum* (3)	*Acacia terminalis* (3)	*Entolasia marginata* (1)	*Gonocarpus teucrioides* (2)	
Eucalyptus piperita (2)		*Leptospermum trinervium* (2)	*Acacia linifolia* (4b)		*Phyllanthus hirtellus* (2)	
Eucalyptus globoidea (1)			*Banksia spinulosa ssp. spinulosa* (4b)		*Smilax glyciphylla* (2)	
Eucalyptus punctata (1)	√		*Acacia longifolia* (2)		*Pimelea linifolia* (3)	
Eucalyptus cypellocarpa (1)			*Grevillea mucronulata* (4b)		*Bossiaea heterophylla* (3)	
			Hakea dactyloides (3)		*Galium propinqum* (3)	
			Bossiaea obcordata (4b)		*Poranthera microphylla* (4)	
			Acacia myrtifolia (2)		*Lepidosperma filiforme* (4)	
			Leptospermum polygalifolium (2)		*Lindsaea microphylla* (1)	
			Pimelea linifolia (2)		*Dianella caerulea var.producta*(1)	
			Pultenaea hispidula (3)		*Goodenia hederacaea* (1)	
			Pultenaea scabra (1)		*Patersonia glabrata* (1)	<u>Foliage Cover (%)</u>
			Persoonia levis (1)		*Xanthosia pilosa* (1)	Av. crown diameter (m)= 4
			Monotoca scoparia (1)		*Pomax umbellata* (2)	av. foliage cover (%) = 10
			Gompholobium grandiflorum (1)		*Dampiera purpurea* (1)	# trees = ≥30
						sample area (ha) =
			Telopea speciosissima (2)		*Lomandra obliqua* (1)	# trees with hollows = ≥ 5
			Persoonia linearis (1)		*Amperaea xiphoclada* (1)	sample area (ha) = 10m
			Pteridium esculentum (1)		*Clematis aristata* (1)	
			Dodonaea triquetra (4b)		*Billardiera scandens spp. scandens* (1)	

			Pultenaea daphnoides (2)		*Acianthus sp*. (1)	
			Acacia ulicifolia (2)		*Phyllotheca hispidula* (2)	
			Alloasuarina littoralis (1)		*Blechnum cartilagineum* (2)	
			Pomaderris lanigerum (1)		*Lomatia silaifolia* (3)	
			Lomandra longifolia (2)		*Lomandra filiformis spp. coriacea* (3)	
			Elaeocarpus reticulatus (1)		*Lomandra gracilis* (3)	
			Callicoma serratifolia (3)			
			Pomaderris andromedifolia ssp. andromedifolia (1)			
Foliage Cover (%) 40		Foliage Cover (%) 15	Foliage Cover (%) 25	Foliage Cover (%) 5	Foliage Cover (%) 40	

PLOT 7

Grazing	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Erosion	Intensity	Nil	Minor	Moderate	Severe	Very Severe	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Fire & Burning	Intensity	Nil	Light	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Clearing	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Cropping	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Logging	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Exotics and Noxious Weeds	Intensity	Nil	Very Low	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Feral sp.	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown

Habitat Features

Hollows under 5cm	Hollows 5-10cm	Hollows 11-20cm	Hollows >20cm
Yes	Yes	Yes	No
Peeling Bark	Fissures	Cracks	Stick Nests
Yes	Yes	Yes	Yes
Soil Cracks	Rocky areas	Caves	Mud Nests
No	Yes	No	No
Fallen Hollow Logs	Fallen Timber	Leaf Litter	Bare patches
Yes	Yes	Yes	No
Mistletoe	Acacia Sp.	Termite Mounds	Casuarina Sp.
No	Yes	Yes	No
Dam	Creek	River	Dead Trees
No	Yes	No	Yes

Is there a presence of

Other Valuable Habitat Features			
	Yes/No & brief description condition		Yes/No & brief description condition
Breeding/ roosting sites	Yes	Rock Outcrops /Formations	Yes
Habitat Garden/Constructed water feature	No	Weedy vegetation used as habitat	No
Cultivated areas used by wildlife	No	Built structures/non-structural features used as habitat	No

CONDITION ASSESSMENT NATIVE VEGETATION - Plot 7

For native bushland and grassland sites and paddocks containing scattered shade trees

Site number or name: 7 **Monitoring date: 24/10/2011**	
Assessment questions	**Answer Yes, No or N/A**
1. Is the area fenced to manage stock access and grazing ? *Healthy bush should be rested for long periods to allow regeneration. To achieve this, it should be fenced off.*	**N/A**
2. Is there regeneration of native trees and shrubs, or if in grassland, regular germination of native herbs eg perennials such as lilies or orchids and annuals such as daisies? *Regeneration of trees and shrubs is necessary for the bush to maintain health, diversity and a range of habitats. An understorey of shrubs encourages small insect eating birds and other native animals.*	Yes
3. Is there a diverse range of tree and shrub species present, eg more than 20 (coast), 15 (tablelands), 10 (western slopes and plains)? (Note: healthy river red gum forest may have only one tree and 5-10 shrub species present). *Diversity encourages a range of native animals and helps the bush withstand attacks of insects and other adverse conditions.*	Yes
4. If grassland, is there a diverse range of grasses and broad leaf herbs present?	N/A
5. Is there adequate ground cover, eg leaves, bark and twigs, or litter (dead grasses)? *Ground cover indicates whether the area is being disturbed by stock and is a measure of tree canopy density and the domination of exotic grasses and weeds.*	Yes
6. Are mosses or lichens on rocks, fallen branches and the ground surface, or are these species, along with liverworts, forming a crust on bare soil?	Yes
7. Are weeds uncommon, sparsely scattered, absent, or mainly around edges of the area? *The understorey may have exotic weeds present. Too many are undesirable and you may need a management plan for their control. Weeds compete with native plants for light, space, water and nutrients.*	Yes
8. Is there a very low incidence of pest animals, eg foxes and rabbits? *Remnant bush can be a refuge for pest animals as well as natives. The feral animals should be controlled.*	Yes
9. Is the patch shape a block or part of a corridor more than 30 metres wide rather than a thin strip? *Blocks of native vegetation have less edge area than strips, so they are less influenced by changes in levels of weeds, predators, noise and climatic effects.*	Yes
10. Is the area greater than 1 ha (coast), 5 ha (tablelands), 10 ha (western slopes), 20 ha (plains), 50 ha (Western Division)?	Yes
11. Is the remnant linked to other remnants by corridors, eg. roadside vegetation, or scattered trees no more than 50 m apart ? *Corridors provide shelter and pathways for native organisms (other than birds) to*	Yes

move over the landscape for feeding, breeding, roosting and expanding territory.	
12. Is there a mix of tree ages present, ie saplings through to old growth with hollows ? *A range of ages and conditions means the bush is regenerating itself and each stage of growth is suitable habitat for native organisms.*	Yes
13. If trees are present is an understorey also present? *An understorey of shrubs encourages small insect eating birds and other native animals.*	**Yes**
14. Is the understorey mostly comprised of native shrubs and / or grasses and broad leaf herbs?	Yes
15. Area there standing trees (alive or dead) with hollows, present in the remnant or paddock ? *Dead trees with hollows are essential for roosting and nesting of a large range of native birds such as parrots and of bats.*	Yes
16. Are the trees mainly healthy, with little or no dieback? *Dieback is apparent if there are bare twigs at the outer part of the tree canopy. It is usually a sign of severe insect attack.*	Yes
17. Are there less than 20 % of trees affected by mistletoe? *Mistletoe is a parasite that invades trees and causes them to lose vigour. Where many trees in an area are affected it is likely to indicate that the area of vegetation is under severe stress.*	Yes
18. Are there logs and fallen timber on the ground? *Logs and dead material are essential habitat for smaller native organisms. But they can also be a harbour for pest animals.*	Yes
19. If scattered paddock trees are unfenced, are stock camps absent? *Bare ground, bare tree roots or the movement of soil all can indicate erosion which needs to be managed and controlled.*	N/A
20. If scattered paddock trees are unfenced, is evidence of stock ringbarking or rubbing absent?	N/A
21. Is the area free of herbicide, insecticide or fertiliser overspray from adjoining areas? *Herbicides and insecticides can kill native plants and small organisms. Fertiliser encourages exotic species by raising nutrient levels.*	Yes
22. Is the area free from the threat of salinity and / or high water tables?	N/A
Total number of 'yes' answers	17

Condition rating - native vegetation				
Number of 'yes' answers			**Vegetation condition rating**	**Need for management attention**
Remnant bushland	**Remnant grassland**	**Scattered paddock trees**		
14 +	9 +	12 +	Healthy	Maintain current management
9 - 13	6 - 8	8 - 11	Good	Needs some management attention
5 - 8	3 - 5	5 - 7	Fair	Needs a significant level of management attention
0 - 4	0 - 2	0 - 4	Poor	Urgent management necessary if you wish to retain area as stock shelter

8.0 REFERENCES

DEC (2004) *The Native Vegetation of the Nattai and Bargo Reserves.* Unpublished Report. Department of Environment and Conservation, Hurstville.

GHD (2008) Environmental Assessment. Southern Highlands Regional Shooting Complex. Vol. 1. Feb. 2008.

GHD (2010) Construction Environmental Management Plan. Southern Highlands Regional Shooting Complex August 2010.

GHD (2010). Ecological Management Plan. Southern Highlands Regional Shooting Complex. Sept. 2010.

9.0 APPENDIX 1

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