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FLORA AND FAUNA REPORT

ENVIRONMENTAL IMPACT STATEMENT: EXPANSION OF LUBKE QUARRY 'CROMER', HUME HIGHWAY, HOLBROOK

May 2007

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1.0 INTRODUCTION

Bald Hill Quarries Pty. Ltd. proposes to expand the existing Lubke Quarry which is located at 'Cromer', Hume Highway, Holbrook - otherwise known as Lot 1 DP 585233. The existing quarry has been in operation for some 30 years. As a consequence of the proposed expansion an Environmental Impact Statement (EIS) is required, including a flora and fauna impact assessment.

A preliminary assessment was conducted on the likelihood of the subject site supporting threatened biodiversity. The proposed works and associated activities were also assessed in order to determine whether they are likely to have a significant effect on any 'threatened species, populations, ecological communities, or their habitats' that may occur on the subject site and surrounding areas.

Under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth), the *Environmental Planning and Assessment Act 1979*, and the *Threatened Species Conservation Act 1995*, an 'Assessment of Significance' has been carried out and is included in this report so that relevant authorities can properly consider the development proposal. This assessment has been undertaken to meet the requirements of the Director-General of the Department of Planning (copy included in the main EIS report).

1.1 Study Area Context and Locality

The quarry is located 5km northeast of Holbrook and east of the Hume Highway. The study area falls within the Greater Hume Shire Local Government Area, the New South Wales 'South-West Slopes Bioregion' and the Murray Catchment Management Authority's 'Upper Slopes Sub-region'.

1.2 Study Area Description

A study area plan is provided at Figure 1. The 'study area' is defined as the proposed quarry extension site (hereinafter called the 'subject site') and the private grazing land in which the subject site is nested. A superficial study of the 'local' area (the adjoining habitat of Cromer Hill, which is part of Morgans Ridge, and the surrounding agricultural land in a 2km radius) was also conducted. Field studies concentrated mainly upon the subject site.



The subject site is located on a hill, between the 321m Australian Height Datum (AHD) and 430m AHD contour levels with a south to south-west aspect, from which good views can be obtained across the surrounding cleared grazing land where isolated, remnant paddock trees, tree lines on boundary fencing and the Hume Highway, and some clumps of remnant vegetation can be observed.

East of the subject site, the well vegetated slopes of Morgans Ridge dominate the skyline.



An intermittent watercourse lies approximately 40m southeast of the subject site, at the foot of Cromer Hill, where an eroded gully has formed. Run-off from the subject site and the adjacent slope of Cromer Hill drains down this watercourse to where it usually flows underground at the lower reach but during high rainfall events flows overland into a neighbouring property to the west, which is evidenced by a broad swathe of Rushes (*Juncus sp.*). North of the subject site natural drainage lines run between Cromer Hill and the existing quarry,

where extraction works have created a series of sediment detention dams.

Geological features include a few large boulders, rock shelves, domes and surface expanses. A large amount of loose surface rock is present although large tors and coppice castles (fractured tors) are absent. The majority of faulting is vertical, facilitating the rapid breakdown of boulders into detached smaller rocks (Michael 2006).

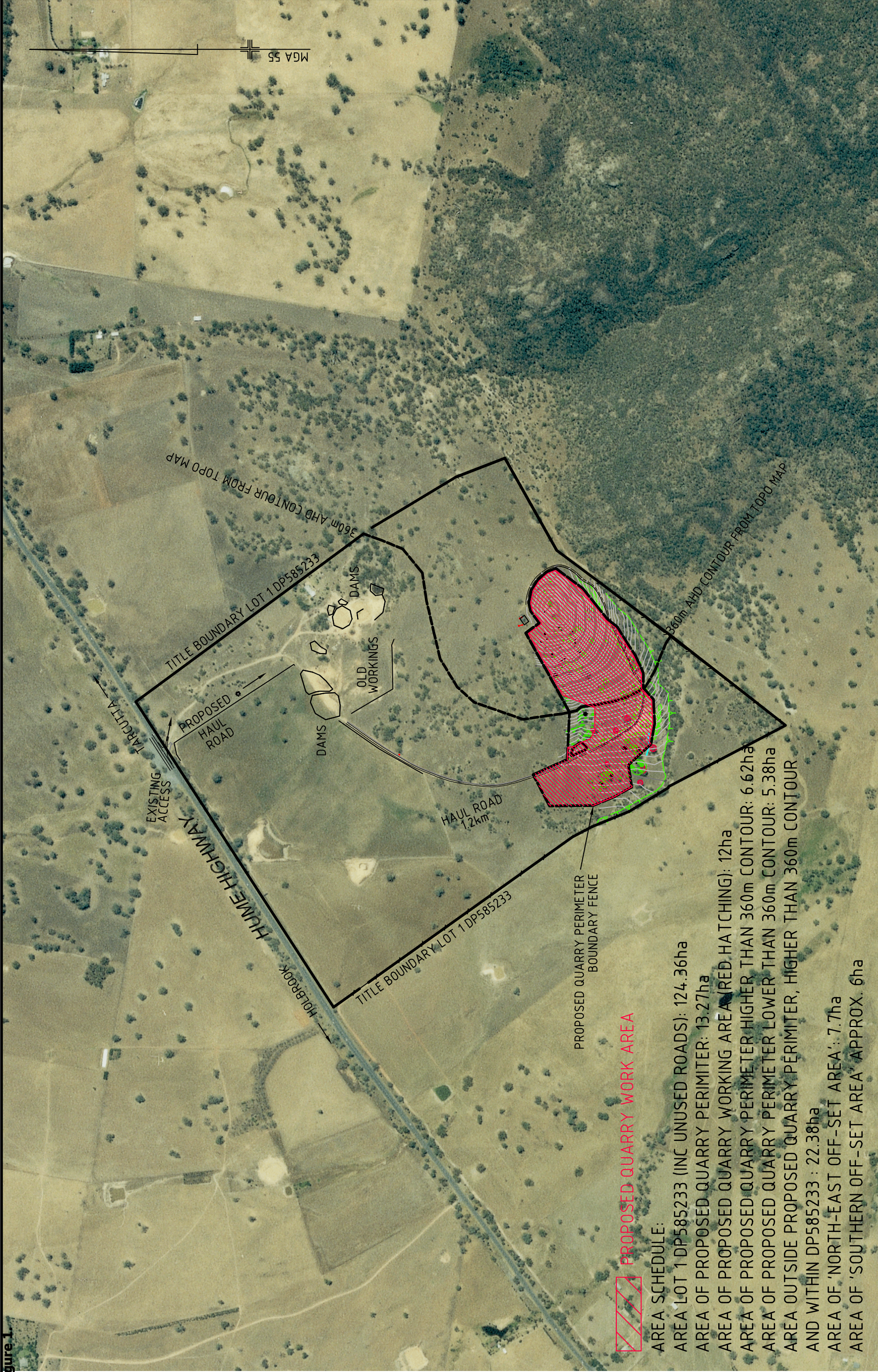
The native vegetation profile of the study area has the following general characteristics:

Table 1:

Landform	Rising country to 360m AHD contour	Rocky knoll between 360m and 430m AHD contour level of subject site
Vegetation Class/Type (Murray CMA)	Western Slopes Grassy Woodlands (White Box-Yellow Box- Blakely's Red Gum Woodland)	Western Slopes Dry Sclerophyll Forest: Rocky Scarps and Ranges Complex
Geology & Soils	Alluvium – sand, silt, gravel & clay. Also granite, gneissic granite & gneiss. Sandy granite soils	Various granite formations dominated by a fine grained plagioclase granodiorite intergrading with quartz porphyry. Highly eroded bed rock ('Nubbin' rock). Sandy granite soils
Location example	East of Hume Highway to 360m contour level in proposed quarry extension area	Proposed quarry extension area

Sources: Stelling 1998; Michael 2006; Murray CMA, Keith 2004; & Walpole Surveying 2006

Figure 1

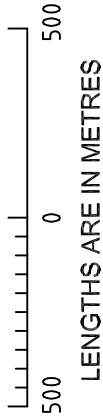


blueprint **PLANNING**
& DEVELOPMENT

SURVEYORS REF:

6567
VERSION
3

SCALE



ORIGINAL
SCALE

SHEET
SIZE
1:10,000
A3

NOTES

BASE IMAGERY DATA FROM LPI
SCAN AERIAL DATA
DECEMBER 2006

STUDY AREA PLAN

LUBKE QUARRY EIS

HUME HIGHWAY, HOLBROOK

1.3 Relevant Legislation

The proposed development involves the preparation of an EIS and requires development consent from the Greater Hume Shire Council. It is noted that the removal of native vegetation proposed under the EIS is exempt from any approval under section 25(f) of the *Native Vegetation Act 2003*.

For the purposes of this report, relevant legislation from State and Federal governments include the following.

1.3.1 NSW Legislation

- *Environmental Planning and Assessment Act 1979 (EP&A Act).*

The NSW EP&A Act is the principal land use and development planning legislation for the State, providing a framework for the overall environmental planning and assessment of development proposals. Various legislation and instruments, such as the TSC Act (below), are integrated with the EP&A Act.

- *Threatened Species Conservation Act 1995 (TSC Act).*

The TSC Act aims to protect and encourage the recovery of threatened species, populations and communities listed under the TSC Act. The TSC Act is aligned with the EP&A Act and requires consideration of whether a development (Part 4) or an activity (Part 5) is likely to significantly affect threatened species, populations and ecological communities or their habitat.

The TSC Act contains seven factors which must be considered by determining authorities regarding the effect of a proposed development or activity on threatened species, populations, ecological communities, or their habitats. These factors form part of the threatened species assessment process under the EP&A Act and are collectively referred to as an 'Assessment of Significance'.

This report recommends several mitigation measures (Section 8) based on the Assessment of Significance (Section 6).

- *National Parks and Wildlife Act 1975 (NP&W Act).*

Under the NP&W Act, the Director-General of the Department of Environment and Climate Change (DECC – formerly the Department of Environment and Conservation), is responsible for the care, control and management of all national parks, historic sites, nature reserves, reserves, Aboriginal areas and State game reserves. State conservation areas, karst conservation reserves and regional parks are also administered. This Act is relevant as it covers the protection of native flora and fauna species within the State of New South Wales. The objects of this Act are as follows:

- (a) *the conservation of nature, including, but not limited to, the conservation of:*
 - (i) *habitat, ecosystems and ecosystem processes, and*
 - (ii) *biological diversity at the community, species and genetic levels, and*
 - (iii) *landforms of significance, including geological features and processes, and*
 - (iv) *landscapes and natural features of significance including wilderness and wild rivers,*
- (b) *the conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including, but not limited to:*
 - (i) *places, objects and features of significance to Aboriginal people, and*
 - (ii) *places of social value to the people of New South Wales, and*

- (iii) *places of historic, architectural or scientific significance,*
 - (c) *fostering public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation,*
 - (d) *providing for the management of land reserved under this Act in accordance with the management principles applicable for each type of reservation.*
- (Parliamentary Counsel's Office n.d.).

- *Fisheries Management Act 1994 (FM Act)*

The FM Act includes provisions to declare and list threatened species of fish and marine vegetation, endangered populations and ecological communities and key threatening processes. Part 7A of this Act complements the TSC Act. Under the FM Act, threatened species means a species is listed as either presumed extinct, endangered or vulnerable (NGH Environmental 2006).

- *Noxious Weeds Act 1993 (NW Act)*

The objectives of the NSW NW Act are to identify which noxious weeds require control measures, identify control measures suitable to those species, and to specify the responsibilities of both public and private landholders for noxious weed control.

- *Native Vegetation Act 2003 (NV Act)*

The objectives of the NSW NV Act are to:

- (a) *provide for, encourage and promote the management of native vegetation on a regional basis in the social, economic and environmental interests of the State, and*
- (b) *prevent broadscale clearing unless it improves or maintains environmental outcomes, and*
- (c) *protect native vegetation of high conservation value having regard to its contribution to such matters as water quality, biodiversity, or the prevention of salinity or land degradation, and*
- (d) *improve the condition of existing native vegetation, particularly where it has high conservation value, and*
- (e) *encourage the revegetation of land, and the rehabilitation of land, with appropriate native vegetation,*

in accordance with the principles of ecologically sustainable development.

(Parliamentary Counsel's Office n.d.).

- *State Environmental Planning Policy No. 44 (SEPP 44) – Koala Habitat Protection*

This policy encourages the conservation and management of natural vegetation areas that provide habitat for koalas to ensure permanent free-living populations will be maintained over their present range. The policy applies to 107 local government areas in NSW. Consequently local councils cannot approve development in an area affected by the policy without an investigation of core koala habitat.

This policy applies as the Greater Hume Shire Council is listed as one of the local government areas. The policy provides the State-wide approach needed to enable appropriate development to continue, while ensuring there is ongoing protection of koalas and their habitat (Department of Planning n.d.). This SEPP is addressed in the main EIS report.

1.3.2 Commonwealth Legislation

- *Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)*

The EPBC Act stipulates that approval from the Environment Minister is required if a development is likely to have a significant impact on matters considered to be of “national environmental significance”.

The aims of the EPBC Act are:

- (a) *to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance; and*
- (b) *to promote ecologically sustainable development through the conservation and ecological sustainable use of natural resources; and*
- (c) *to promote the conservation of biodiversity; and*
- (d) *to provide for the protection and conservation of heritage; and*
- (e) *to promote a co-operative approach to the protection and management of the environment involving governments, the community, land-holders and indigenous peoples; and*
- (f) *to assist in the co-operative implementation of Australia's international environmental responsibilities; and*
- (g) *to recognize the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and*
- (h) *to promote the use of indigenous peoples' knowledge of biodiversity with the involvement of, and in co-operation with, the owners of the knowledge* (Austlii 2006:para.1).

Matters of national environmental significance listed under this EPBC Act include:

- World heritage properties;
- RAMSAR¹ wetlands of international importance;
- Listed threatened species and communities;
- Migratory species protected under international agreements;
- Nuclear actions; and
- The Commonwealth marine environment.

This flora and fauna assessment considers whether the proposed development has the potential to have a significant impact on any of these matters.

¹ A Ramsar wetland is an Australian wetland on the List of Wetlands of international importance kept under the Ramsar Convention - an international treaty which provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources, signed in Ramsar, Iran, in 1971.

1.4 Study Team

Vegetation and general fauna surveys were conducted by the author (Glenda Datson). Reptile surveys were conducted by Damian Michael, Principal, Ecotone Wildlife and Habitat Assessments and senior research ecologist in landscape ecology with the Centre for Resource and Environmental Studies (CRES), Australian National University (ANU). Anabat analysis was conducted by Craig Grabham, Senior Ecologist with GHD Pty. Ltd. Co-ordination of the study efforts was undertaken by the author.

The study team holds a range of qualifications and experience relevant to studies undertaken in relation to the proposal.

The author holds an Associate Diploma of Amenity Horticulture and has completed several subjects from the Diploma of Conservation and Land Management. She has been involved for over 20 years in the production of indigenous and exotic plants and with the use of these plants in amenity landscaping, large scale revegetation projects, and home gardens. As a keen field naturalist, she retains active memberships of the Bird Observers Club of Australia, Victorian and Albury-Wodonga Field Naturalists' Clubs, the Australian Plants Society (APS) and the APS North-east Garden Design Study Group. She works in the field of conservation and land management and has conducted flora and fauna assessments in NSW and Victoria over the past 17 years for private landowners, local government authorities and State departments. She was recently involved with three major threatened species and habitat conservation strategies for Thurgooona, Albury Ranges and Wodonga, whereby large tracts of privately owned land were set aside for conservation purposes, thus providing a level of certainty for developers and government agencies regarding lands available for development purposes, given environmental legislative requirements. Those strategies supported and strengthened the primary objective of sustainable land use and merged conservation and urban design requirements into an effective planning framework.

Damian Michael holds a Bachelor of Science – Chemistry and a Bachelor of Applied Science (Hons) – Parks Recreation and Heritage. He is currently enrolled as a PhD student with the CRES, where his thesis topic is the management of rock outcrops and their role in the conservation and ecology of saxicolous reptiles in modified landscapes. His principal role as senior research officer with CRES is the management of Victorian and NSW South West Slopes long-term monitoring programs, life history studies and natural experiments (see web page <http://cres.edu.au/dbl/damianpage.php>). He has been a self employed herpetologist for ten years, involved in conducting ecological surveys and preparing reports for the NSW DECC, Parks Victoria, Victorian Department of Sustainability and Environment and local government.

Craig Grabham holds a Bachelor of Applied Science (Hons), Parks Recreation and Heritage. He has completed numerous targeted microchiropteran bat surveys, and surveys which have been part of broader flora and fauna assessments. Methods employed during these surveys to date have included: harp trapping, mist netting, direct searches of habitat, roost watching, radio tracking and anabat survey and analysis. Surveys have ranged from small-scale residential development assessment to larger fauna surveys of national parks and nature reserves. Craig has extensive experience designing and implementing ecological surveys and assessments in south-eastern Australia, having completed more than 60 projects, most of which have included survey and/or assessment of threatened biota. The majority of Craig's work has been completed in the greater South West Slopes and Riverina regions of NSW and Victoria.

2.0 THE PROPOSAL

The proposal is described in adequate detail in the main EIS report but essentially includes the expansion of the existing quarry (approximately 6ha) to an area of approximately 12ha. The quarry will be expanded in stages, in accordance with the Extraction Methodology Plan detailed in the main EIS report. The extraction rate of material will be no more than 200,000 tonnes of material per annum for 20 years and the material will be used in major infrastructure projects within the region such as the Hume Highway dual carriageway construction proposal between Table Top and Tarcutta.

The proposed works and associated activities of this project include:

- Expansion of the existing quarry;
- Site drainage and sediment control works;
- Clearing of the vegetation over the site;
- Upgrading of the quarry access road; and
- Rehabilitation of affected areas.

It is expected that blasting will occur approximately once per month during daylight hours, when noise, vibration and dust will arise. Dust generation would be minimized by water cart spraying over roads and operations areas and by the use of micro-sprays at the crushing plant as required depending on wind, temperature, intensity of operations, etc. Blasting may occur several times on one day in one month, but then not again for a couple of months (pers. comm. J. Wilkinson December 2006). It is proposed that excavated soil will be placed in Zone 1 of the study area, as depicted on the proposed Rehabilitation and Native Vegetation Offset Replanting Plan (refer to the main EIS report). Crushing operations could possibly occur until 10.00pm and truck movements may occur at any time. Peak operations would be over the next 3-5 years (2007-2010/2012).

Also, three trees either side of the property entrance on the Hume Highway (six in total) are proposed for removal in the interests of safe intersection sight distance (SISD) for traffic exiting the site. The Traffic Impact Statement included in the EIS deals with this requirement. Details of these trees are included in Section 4.1.6 of this report.

3.0 METHODS

3.1 Preliminary Assessment and Literature Search

A preliminary assessment including a desktop review was undertaken, as requested by DECC during planning focus meeting investigations. This preliminary investigation was undertaken to indicate the need for a detailed survey of the site as required. Preliminary database searches as well as a literary review were undertaken before conducting the field surveys. Initial studies included a Protected Matters Search of the Department of Environment and Heritage (now the Department of Environment and Water Resources) database information on Threatened Species and Endangered Ecological Communities listed under the EPBC Act. The NSW Bionet webpage and NSW Wildlife Atlas provided threatened species recordings within the Greater Hume Local Government Area and the DECC webpage database provided threatened species, populations and ecological communities information. A fauna report covering some nearby areas of Morgans Ridge was obtained and reviewed. This helped to overcome limitations associated with a brief survey period, providing a broader range of data, a range of seasons in which surveys were

conducted and survey techniques. The findings of these reviews are summarized in Tables 2-5, Section 5.

Also, the *BioMetric* Operational Manual currently utilised by NSW Catchment Management Authorities as a terrestrial biodiversity assessment tool for Property Vegetation Plans (developed under the NV Act for use when assessing impacts of management actions) was used as a guide to direct the Assessment of Significance undertaken in this report to ensure consistency of assessment methodology approaches.

The subject site is not a World Heritage Property, Ramsar Wetland, Commonwealth Marine Area or Commonwealth Reserve.

Information sources used in order to obtain an accurate inventory of flora and fauna species and their habitat are included in Section 9.

Also, aerial photograph interpretation was used to determine the spatial distribution of existing vegetation, including the connectivity of the vegetation of the subject site with that of the adjacent Cromer Hill. Landowners were also consulted regarding their knowledge of soils and fauna usage of the study area.

In general, this assessment evaluated the significance of sites in three geographical contexts being the Local, Regional and State level. For the purposes of this assessment these geographic areas can be defined as follows:

- Local/locality – the area within two kilometers radius of the subject site;
- Regional – the area defined as the Greater Hume Shire local government area; and
- State – the region identified by DECC as the South West Slopes which includes lands from the NSW border in Albury to Tumbarumba to the north-east.

3.2 Field Survey

The study area's key environmental values were assessed (more intensely within the subject site), with the focus primarily on flora and fauna species of conservation significance. Rapid assessment of the area was made utilizing the DECC Grassy Box Woodlands Conservation Network's 'Biodiversity Conservation in the Wheat/Sheep Belt of NSW Project, Site Vegetation & Bird Survey Proforma 2006'. The data collected was recorded on these forms and is summarised in this report. Other survey techniques employed are described below.

Flora

A contour map of the subject site, overlaid with the location, measurements and types of trees, was used in the field (a copy of this map is included as a Work Area Plan in Appendix 7), as follows:

- Type = 'Box', 'Gum', 'Other', and 'Stag' (colour coded)
- Trunk diameter at breast height = '20-59cm', '60-89cm', and '>90cm'.

Trees with stem diameters at breast height of less than 20cm were not mapped, hence any regenerating vegetation is not depicted unless it is included as a clump surrounding large trees.

Flora surveys were undertaken in the subject site by (a) traversing the area on foot using the Random Meander Survey Technique, and (b) the use of plot based surveys. Plot based sampling involved the setting up of 20m x 50m quadrats (with a 20m x 20m plot nested within each

quadrat) and recording species distribution and abundance therein. Two quadrats per stratification unit (vegetation communities) were sampled, and all flora species recorded are listed in Appendix 2.

Habitat

Habitat surveys of dead standing (stag), fallen and live trees, arboreal links, native and exotic grass areas, rocky substrate and the watercourse were conducted for birds, reptiles, mammals, amphibians and fish. A superficial study of the adjoining habitats was made by walking along the fencelines, viewing adjoining vegetative cover with binoculars from a higher elevation, and driving across the study area. Habitat results have been included in the flora and fauna results.

Reptiles

Reptiles were surveyed by actively searching all available habitats over the subject site including beneath rocks, logs, bark and leaf litter as well as inspecting the crevices of rocks and stumps using a hand held torch.

Amphibians

Call playback of frog species was not undertaken due to the lack of suitable habitat for threatened species and because the site was dry at the time of survey.

Bats

Anabat surveys were conducted for microchiropteran bats. The echolocation calls of insectivorous bats were recorded using ultrasonic detectors (Anabat II Bat Detectors) coupled with Compact Flash Zero Crossing Analysis Interface Modules (CF ZCAIMS; Titley Electronics, Ballina NSW) and stored on compact flash (CF) memory cards for later computer analysis. Surveys began at or soon after dusk and were conducted for the entire night. Prior to field placement each detector was calibrated and fixed to ensure all were operating at the same sensitivity level (7, the maximum is 10). Detectors were orientated at a 45 ° angle to the ground.

Nomenclature for bats will follow that of Churchill (1998) with the exception of *Tadarida australis* which has been used instead of *Nyctinomus australis* after Reardon (1999).

Calls collected during the field survey were identified using zero-crossing analysis and Analook software by visually comparing call traits with reference calls. Reference calls were sourced from previous surveys conducted in the region by Grabham (Jan. 2003 to Jan. 2004). No reference calls were collected during the survey. The *Bat calls of NSW: Region based guide to the echolocation calls of microchiropteran bats* (2004) was used as a guide to call analysis. Due to the lack of local reference calls, high level of intra-specific variability and inter-specific overlap in call characteristics, the conservative approach was taken when analysing the calls.

A call was defined as a sequence of three or more consecutive pulses of similar frequency. Pulses separated from another sequence by a period of five seconds were considered to be separate calls. Scattered sequences, where intermittent pulses were not separated by more than five seconds, were recognised as a single pass. Where constant activity was recorded, a single pass was defined as 15 seconds (i.e. one full display screen comprising as Anabat sequence file). Although this method underestimates the number of bat passes when there is continuous activity, the standard unit of time remains consistent (Law et al. 1998, 1999). Due to variability in the quality of calls and the difficulty in distinguishing some species the identification of each call was assigned a confidence rating (see Mills et al. 1996 and Duffy et al. 2000) as summarised in Table 5.

Birds

Six 20 minute surveys were conducted in six two hectare plots, representing a range of habitat types, over four hours after sunrise. Other birds identified outside the formal 20min 2ha survey periods were also recorded.

No nocturnal surveys or targeted call playback (mimicry) was conducted for nocturnal birds because (a) potential habitat for threatened species of nocturnal birds such as the Barking Owl and Powerful Owl was present in the study area; and (b) due to limitations such as drought and very recent burning of potential nearby the presence of these species during the survey period may have been affected; and (c) there are records for at least one of these species in similar nearby habitat (NSW Wildlife Atlas 2006). Therefore they were assumed to be usually present in the study area.

Mammals

Opportunistic sightings of other fauna, such as kangaroos and wombats, were recorded. No 'stag' watching, spotlighting or trapping techniques were undertaken for arboreal mammals because the likelihood of the presence or absence of threatened species was indicated by documented records for the area or the presence or absence of suitable habitat.

3.3 Timeframe and Potential Limitations

The diurnal field surveys were conducted over three survey periods between the 9th December 2006 and 9th January 2007. The weather was warm, with zero cloud cover, low humidity and wind strengths varying from nil to moderate. No rainfall was recorded at the site during the survey period. The timing of the study during summer and associated extreme drought conditions, coupled with very recent grazing of the subject site reduced the ability to detect the presence of some fauna and flora species and ground cover plant diversity.

There is a close relationship between drought and food supply. The reduced availability of water and food resources such as nectar, pollen, seed and insects influences the presence of fauna species and population numbers and increases competition for available resources. The recent back-burning of the adjacent vegetation of Cromer Hill (and Morgans Ridge) reduced the ability to benchmark at least the ground cover species richness and abundance of this site against that of the subject site. Back-burning also influenced the abundance of kangaroos on the subject site and possibly the presence or absence of other species such as bats and reptiles. The presence of some seasonal or migratory species may also have been influenced by the climatic conditions. For example the Rainbow Bee-eater nesting tunnels in the banks of the adjacent watercourse were observed to be those of old sites, that is, constructed during previous wetter seasons, and no recent nesting tunnels were observed. Low numbers of Diamond Firetails were observed on the subject site, a factor likely to have been affected by the low availability of native grass seed due to drought and increased grazing pressures by cattle and kangaroos.

To overcome these limitations the habitat requirements for each of the threatened species listed by DECC as having the potential to occur in the region were checked against the habitat resources which would occur in the study area during normal climatic conditions or in other seasons. The Assessment of Significance was then conducted for those threatened species for which the habitat resources were relevant.

4.0 RESULTS

4.1 Fauna

A total of 57 native fauna species were recorded during the survey period. Many more species could be expected to occur here but were not recorded due to the short survey period or because of the unfavourable conditions (refer Section 3.3). Three threatened species listed under the TSC Act and one terrestrial migratory species listed under the EPBC Act were observed. These are discussed below.

4.1.1 Amphibians

No frog species were heard calling or observed within the subject area during the survey. The badly eroded watercourse adjacent to the subject site has some limited potential to provide habitat for common species. Searches of NSW Wildlife Database revealed a total of 13 species of amphibians recorded in the Greater Hume LGA. The Southern Bell Frog (*Litoria raniformis*) and the Booroolong Frog (*Litoria booroolongensis*) were the only threatened frog species recorded within this LGA. These species are recorded in the Woomoogarma National Park, approximately 25kms to the south and consequently, due the habitat preference of these species, they are unlikely to be effected by the proposed development.

4.1.2 Reptiles

Reptiles were surveyed by actively searching all available habitats over the subject site including beneath rocks, logs, bark and leaf litter, as well as inspecting the crevices of rocks and stumps using a hand-held torch. Twelve individuals were recorded during the survey encompassing seven species from the families *Scincidae* and *Gekkonidae* (See Appendix 1). All species are considered secure throughout the south west slopes although three species (Eastern Stone Gecko, Carnaby's Wall Skink and Tree Crevice Skink) reach their highest densities on rock outcrops in the region, particularly granite formations as observed at the subject site.

No threatened species were recorded or were expected to occur based on the lack of suitable habitat, that is:

- the absence of appropriate rock (granitorised rhyodacite), Kangaroo Grass and associated ants made it unlikely that the Pink-tailed Worm Lizard was present;
- bioclimatic conditions were outside those preferred by the Little Whip Snake; and
- the lack of termitaria, hollow logs and the size of the remnant made it unlikely that Rosenberg's Goanna was present.

Based on habitat suitability and distance to larger remnants, other species that are likely to be present include the Olive Legless Lizard, Eastern Bearded Dragon, Lace Monitor, Dwyer's Snake, Woodland Blindsnake, Eastern Brown Snake and Red-bellied Black Snake. The Lace Monitor is known to be present in the study area, frequenting the trees near the house site, below the existing quarry site (P. Lubke, pers. comm. January 2007).

4.1.3 Birds

A total of 39 native species were either heard or observed during the survey period. A search of databases and other survey information was made to determine the potential for other species to utilise the resources of the subject site. A total of 33 bird species listed as 'Vulnerable' or 'Endangered' in NSW and/or nationally have been recorded in the Greater Hume LGA. Of these, 17 are likely to be present on the subject site from time-to-time (see Table 2, Section 5). The Diamond Firetail, Black-chinned Honeyeater and Rainbow Bee-eater were observed on the

subject site. Also, the Dusky Woodswallow, Red-capped Robin, Southern Whiteface and Jacky Winter were observed during the survey and these are listed as 'disappearing woodland birds of conservation concern' (Reid 1999 & 2000; Traill & Duncan 2000; Garnett & Crowley 2000). Suitable habitat for most of the birds recorded during the survey is to be retained in the study area and is enhanced by the adjoining Cromer Hill and Morgans Ridge habitat. The loss of foraging habitat for the Diamond Firetail is of most concern. This is discussed further at Section 7.

4.1.4 Mammals

The Eastern Grey Kangaroo (*Macropus giganteus*), Common Brush-tail Possum (*Trichosurus vulpecula*) and Common Wombat (*Vombatus ursinus*) were recorded at the subject site during the survey period.

Kangaroo numbers were higher than usual due to the recent back-burning of Morgans Ridge (P. Lubke, pers. comm. December 9, 2006). It is expected that the current drought is also influencing their movement patterns in the study area. About 20 individuals including young joeys were observed.

There appears to be a healthy population of wombats in the study area, with observations of dens and tunnels across the south facing slope and watercourse.

Two anabat detectors coupled with CF ZCAIMS were placed for three nights at two locations within the subject site. Analysis revealed the presence of eight species within the subject site. The threatened Large Bent-wing Bat (*Miniopterus schreibersii oceansis*) was tentatively identified as a result of Anabat analysis, however the quality of the call and overlap with Forest Bats (*Vespadelus species*) prevented a positive identification. Considering that this species has been recorded previously within the locality (Herring 2001: 2002) it is considered likely that this species would occur within the subject site.

Whilst no spotlighting was conducted for the threatened Squirrel Glider it is considered that it is highly likely to occur in the study area because:

- it has been recorded in the Billabong Creek and adjacent Box-Gum Woodland habitat in the Holbrook area during the Heartlands study (Herring 2001, 2002);
- suitable Box-Gum Woodland habitat in the form of large, hollow bearing trees can be found on the subject site; and
- the habitat on the subject site connects via a vegetated gully to other similar habitat at the base of Morgans Ridge.

4.1.5 Koala habitat

Koala habitat contains areas of native vegetation where the trees of types listed in Schedule 2 of *State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP44) constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. The feed tree species which occur in the LGA which are listed in Schedule 2 of SEPP44 are White Box, Ribbon Gum and River Red Gum. White Box occurs in the study area, representing more than 15% of the tree species composition, but the subject site contains only one specimen of this species. However the presence of this species constitutes potential koala habitat. The nearest known koala habitat is at Mullengandra, some 30kms south, and there is a recording at Woomargama NP, 25kms to the south-east (DECC Wildlife Atlas 2007). However those sites are not connected to the study area. Therefore it is highly unlikely that koalas would be present in the study area and the study area could not be categorized as core koala habitat.

4.1.6 Habitat Value

Trees were assessed individually from the ground, aided by the use of binoculars. The large trees in the subject site have high habitat value because:

- (a) generally trees with a diameter at breast height of $>0.6\text{m}$ contain hollows suitable for a variety of wildlife, and
- (b) there is an arboreal connection between these trees and the well vegetated slopes of Morgans Ridge which allows for wildlife movement throughout.

According to *Biometric* (2005) guidelines, the connectivity value of the subject site is high because the vegetative cover is not in a 'low' condition (see Vegetation Quality Summary, Section 4.3), and there is a $>100\text{m}$ wide vegetative link to the adjoining native vegetation of Cromer Hill, which is part of Morgans Ridge.

The main habitat zones which occur on the subject site are:

- 'Zone 1': This area falls below the 360m AHD contour level on deeper, more fertile soils and contains most of the larger, taller trees, including an emergent White Box. White Box are known, when flowering, to attract a number of nectar and insect feeding birds, including many threatened species and disappearing woodland birds. Also these larger, hollow bearing trees provide essential nesting and roosting habitat for threatened species, such as the Barking Owl and Squirrel Glider, and the loss of these trees in the landscape is the primary cause of the decline in numbers of these species. This area has, however, been highly modified by grazing practices which have completely removed the middlestorey vegetative cover and reduced the ground layer to one which is now dominated by exotic weed and pasture species.
- 'Zone 2': This area lies above the 360m AHD contour level and contains large expanses of rocky substrate suitable for some reptiles, as well as expanses of native grasses upon which grass-seed eating species such as the Diamond Firetail forage. Also, the regenerating Drooping She-oaks at the higher elevations provide habitat for several Thornbill and other bird species. The Tumbledown Red Gums in this zone are mostly trees of $<0.6\text{m}$ diameter at breast height, however there are eight trees with trunk diameters $>0.6\text{m}$. These trees are largely of short stature and do not contain upper scaffold hollows. The Common Wombat has excavated several den sites across the mid to upper elevations of this site, generally beneath trees and rocks.



Forty metres east of the subject site a relatively well vegetated watercourse can be found ('Zone 3'). This intermittent stream contains a deeply eroded gully where the Common Wombat is exacerbating erosion issues with numerous tunnels having been washed through during high rainfall events, carrying away large quantities of soil. When standing on the stream bed old, tunnelised nest sites for both the Rainbow Bee-eater and the Spotted Pardalote can be observed in some parts. These sites have been used by these birds in

previous wetter years and erosion is causing collapse of the banks and hence these nest sites.

This watercourse links the Box-gum Woodland west of the subject site to the Dry Sclerophyll Forest on Cromer Hill.

Below the 360m AHD contour level, the surrounding land to the south and west is grazing land containing isolated paddock trees, with a treed corridor running alongside the Hume Highway. Due to agricultural practices these areas are missing the key ecological native shrub and ground layer components, and are comprised largely of introduced ground layer species. Hence they are of much lower value to wildlife than areas containing these key habitat values. Where trees are connected, such as in large clumps and roadside strips, habitat values are greater.

The six trees proposed for removal either side of the property entrance are Yellow Box and White Box species and form part of a vegetated roadside corridor. Their diameters, measured at 1.3m trunk height, were found to range from 0.5 to 0.8m and all were exhibiting symptoms of drought induced stress. Whilst most contained minor cracks and fissures between or within the trunk and Decorticated bark of the tree stockings, none provided hollows.

Above the 360m AHD contour level, north of the subject site, grassy, rocky habitat with a sparse overstorey of scattered trees can be found. Cromer Hill, east of and adjoining the subject site, contains the highest environmental values for wildlife, with a high cover of a variety of Eucalyptus, Acacias and Kurrajongs. Unfortunately, the recent bushfire has impacted upon much of the middle, lower and ground storey species on which many species rely for resources such as shelter, nectar, seed and insects. This fire is likely to influence the presence/absence of some species within the study area for at least two years, until the ground and shrub layers regenerate.



4.2 Flora

The on-ground survey split the vegetation into two zones, as per the following vegetation types:

4.2.1 Box-Gum Woodland

Generally the area below the 360m AHD contour level is part of the Western Slopes Grassy Box Woodland, as defined by Keith (2004). The characteristic dominant species for this vegetation type are White Box (*Eucalyptus albens*), Yellow Box (*Eucalyptus melliodora*) and Blakely's Red Gum (*Eucalyptus blakelyi*), with associated species of Red Box (*Eucalyptus polyanthemos*), Apple Box (*Eucalyptus bridgesiana*), Red Stringybark (*Eucalyptus macrorhyncha*) and White Cypress Pine (*Callitris glaucophylla*). The characteristic mid-storey species in the western slopes are *Acacia decora* and *Acacia implexa*, with groundcover species being Red leg grass (*Bothriochloa macra*), Spear grasses (*Austrostipa* spp.), Common wheat grass (*Elymus scaber*) Kerosene grass (*Aristida ramosa*), Wallaby grasses (*Austrodanthonia* spp.), Yellow Rush Lily (*Tricoryne elatior*), Wattle mat-rush (*Lomandra filiformis*), Fuzzweed (*Vittadinia cuneata*) and *Oxalis perennans*. The estimated clearance of this vegetation type in the Region is 90% (M. Mulvaney, pers. comm. January 2007).

The corresponding ecological community is **White Box-Yellow Box-Blakely's Red Gum (Box-Gum) Woodland is listed as an Endangered Ecological Community (EEC)** under the NSW TSC Act 1995, whilst the Commonwealth EPBC Act lists it as the **White Box-Yellow Box-Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands EEC**.

Remnant trees in this zone include a large White Box, many Blakely's Red Gum and a few Red Box trees. Good regeneration of Red Gum from windshed seed has occurred, with only coppiced regrowth from a fallen White Box. The shrub layer has been completely removed and the ground layer is dominated by exotic weeds such as Paterson's Curse, flat weeds and pasture grasses such as Bromes, Rye grass and Squirrel-tail Fescue. A low percentage cover of Wallaby grass can be observed across this zone.



Although the site is degraded, utilisation of the NSW National Parks and Wildlife Service identification guidelines has determined that it meets the criteria for 'Box-Gum Woodland EEC', listed under the NSW TSC Act. The Commonwealth Threatened Species Scientific Committee has a slightly different set of criteria for determining whether the site meets the definition of the community as 'White Box-Yellow Box-Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands EEC' as listed under the EPBC Act. By working through the guidelines provided by the Department of the

Environment and Heritage (2006a)(now Department of Environment and Water Resources), it was determined that the site did not meet the criteria of the listed ecological community.

The Box-Gum Woodland of the agricultural land surrounding the study area is generally in similar condition to that within the subject site in that it is missing the major ecological components of the middle and lower-storey vegetative layers. It now contains an overstorey of scattered trees, with a tree density cover of about 4%, over a mostly introduced ground layer of pasture grasses and weeds. 90% of the EEC has been cleared in the LGA leaving a 10% representation of its former extent, now reduced to mostly degraded remnants of varying tree cover density.

4.2.2 Rocky Scarps and Ranges Complex



Generally the area above the 360m AHD contour level is part of the 'Dry Sclerophyll Forest' vegetation formation in the 'Western Slopes Dry Sclerophyll Forest' vegetation class as defined by Keith (2004). In the Murray CMA this vegetation type contains dominant canopy species of Blakely's Red Gum (*Eucalyptus blakelyi*) and Drooping She-oak (*Allocasuarina verticillata*) and may be associated with Currawang (*Acacia dorotoxylon*), Black Cypress Pine (*Callitris endlicheri*) and mallee form

Eucalyptus such as *Eucalyptus dwyeri* and *Eucalyptus vicina*. The characteristic groundcover species are a low cover of perennial tussock grasses such as *Aristida* spp., *Austrostipa* spp., *Austrodanthonia* spp., *Isotoma axillaris*, *Calotis cuneifolia*, *Wahlenbergia tumidifructa*. The mid-storey species are *Cassinia laevis*, *Calytrix tetragona*, *Leptospermum divaricatum*, *Pimelea simplex*, *Pandorea dorotoxylon*, *Mirbelia pungens* and *Phebalium obcordatum* (Murray CMA Vegetation Benchmarks 2006). The estimated clearance of this vegetation type in the Murray catchment is 10% (Murray CMA 2006). This vegetation community is not an endangered ecological community.

On this site, the vegetation type does not match the benchmark species closely, with the dominant species here being Tumble-down Red Gum (*Eucalyptus dealbata*), however there appear to be enough dominant characteristic species (e.g. *Acacia dorotoxylon* & *Allocasuarina verticillata*) to categorise it as 'Rocky Scarps and Ranges Complex', and certainly there appears to be no other closely aligned vegetation type listed in the Murray CMA in which the site could be included.

This zone is degraded in that the vegetative cover has to a large extent at some stage been removed (the tree cover density is now 8%). This assumption can be made by comparing it to the adjacent slopes of Cromer Hill, where the tree cover density is approximately 80%. The upper elevations of the subject site, south of the knoll, contain a good cover of small diameter stems of Drooping She-oak, a few Currawang and Red-stem Wattle (*Acacia rubida*), along with Tumbledown Red Gum and Kurrajong (*Brachychiton populneus*). Although the subject site has been grazed during the survey period, the ground flora across this zone (outside the rocky

areas) appears, in the prevailing drought conditions, to contain a >50% cover of diverse native plants such as Wallaby grass, Red-leg grass, Wire grasses, Spear grasses, Barbed-wire grass, Weeping grass, Common Wheat grass, Chocolate Lily, Native Geranium, Variable Glycine, Sarsparilla, Wattle Mat rush, Rock Isotome, Nodding Blue Lily, Rush Lily, Tall Flax Lily, Native Dock, Fireweed and Ferns. Also, introduced species such as Cape Weed, Quaking grass, Barley grass, Dandelion, Sheep Sorrel and Onion grass were prevalent.

Above the access track, the southeast corner of the subject site contains a high cover of St Johns Wort, a noxious weed.

North of the knoll, between the 430m and 410m AHD contour levels within the subject site, the ground cover, whilst containing native plants, has been impacted upon by a large expanse of the noxious weeds Horehound, Star Thistle and Scotch Thistle and Common Heliotrope and Wild Oats.

Forty metres east of the subject site the banks of the watercourse contain a complex of some large Blakely's Red Gum and smaller Tumbledown Red Gum, with odd Red Stringybarks (*Eucalyptus macrorhyncha*) and large Bundy (*Eucalyptus nortonii*) occurring on top of the gully banks. Currawang and Prickly Tea Tree (*Leptospermum continentale*) were observed here.

No plant species which are listed in Schedules 1 or 2 or the TSC Act, listed under the EPBC Act or listed as Rare or Threatened (ROTAP species) were found in the study area.

4.3 Vegetation Quality Summary

The Murray Catchment contains eleven 'Mitchell Landscapes'¹ which are >70% cleared (Mitchell 2002 – cited in the Murray CMA Draft Catchment Action Plan 2006). The subject site occurs within the 'Tipperary Hills Granites Mitchell' landscape, which is not an overcleared landscape (M. Mulvaney, pers. comm. December 2006).

Using an aerial photo-based map of the locality (refer to Tree Cover Plan, Appendix 8) it can be seen that in a 2km radius from the subject site about 26% vegetative cover has been retained. Using the *Biometric Operational Manual 2005* (p. 39) as a guide to indicate the percentage cover of native vegetation at the landscape scale, Box-Gum Woodland represents only about 4% of that cover with the remainder being Dry Sclerophyll Forest cover on Cromer Hill.

In the subject site, the tree cover density of 'Zone 1' (Box-Gum Woodland EEC) is estimated to be 12%.

The tree cover density of 'Zone 2' (Rocky Scarps & Ranges Complex) of the subject site is estimated to be 8% (see Appendix 8).

Across the study area the tree cover density is 10%.

According to the *Biometric* Tool Assessment benchmarks for tree cover density, where the percentage foliage cover is <25% of the lower value of the overstorey percentage foliage cover benchmark for that vegetation type, the EEC quality is regarded as "Low". This benchmark for the Box-gum Woodland EEC is 14-27% (D. Costello, pers. comm. December 2006). Therefore, 25% of the lower benchmark of 14% is 4%. As 'Zone 1' of the subject site contains 12% tree cover density, then the EEC on this site must be regarded to be at least of "Medium" quality, even though the ground layer contains <50% native species.

¹ An analysis of NSW landscapes vegetation coverage undertaken by Mitchell 2002. Under the NSW Native Vegetation Act native vegetation cannot be cleared if it occurs in an over-cleared landscape (>70% of native vegetation in Mitchell landscape cleared), or is an over-cleared vegetation type (>70% of vegetation type in the CMA is cleared), or is a threatened ecological community (as listed on the TSC Act or EPBC Act) and is NOT in a 'low condition'. Vegetation that is in low condition can be assessed further for clearing (*BioMetric* Version 1.8).

Because benchmarks are not available at this stage for Rocky Scarps and Ranges Complex vegetation type, the Box-Gum Woodland EEC tree cover density benchmark was used as a comparison for 'Zone 2'. Because the tree cover in this zone is also greater than the lower benchmark, and because the ground layer contains >50% native species, the vegetation type can also be regarded as "Medium" quality.

4.4 Ecological Integrity

A variety of environmental features was searched for during the site surveys. These included canopy layer health, tree age class mix, presence of hollows, dead standing trees, large trees >60cm dbh, stumps, mistletoes, regenerating trees, shrubs, earth banks and gully walls, fallen timber, rock outcrops and large boulders and litter. Disturbance intensities such as grazing, erosion, fire and burning, clearing, logging, firewood collection, exotic infestations and the presence of feral animals were investigated. Habitat complexities such as the percentage cover of all plant species within structural layers and fallen timber and rock outcrops were also investigated. From the data collected it is concluded that the ecological integrity of 'Zone 1' is "Low" and Zone 2 is "Medium".

5.0 FLORA AND FAUNA IMPACT ASSESSMENT

The following tables present the threatened species, populations and ecological communities which occur in the Greater Hume LGA. The likelihood of each of the threatened species occurring within the study area was assessed given the habitat requirements of each species and known records of each species in the region.

An Assessment of Significance to address the impacts of the proposal on threatened species and populations has been undertaken in Section 6.

5.1 Fauna

Table 2: Summary of fauna species of Conservation Significance known or predicted to occur within the Upper Slopes Murray CMA sub-region of the Greater Hume LGA

Species	Source	Status		Habitat present in study area
		NSW	National	
Southern Bell Frog <i>Litoria raniformis</i>	DECC DEW	Endangered (Schedule 1- Part 1)	Vulnerable	No. Requires permanent large ponds of water with abundant fringing vegetation.
Booroolong Frog <i>Litoria booroolongensis</i>	DECC	Endangered (Schedule 1)	-	No. Recorded in the Woomargama National Park (NP) and almost always associated with rocky flowing streams in mountainous habitat. This site is not suitable habitat.
Pink-tailed Worm Lizard <i>Aprasia parapulchella</i>	DEW DECC	Vulnerable (Schedule 2)	Vulnerable	Unlikely to occur on the site. All areas potentially impacted upon by the proposal were searched and no suitable habitat was found. (See specialist reptile report, Appendix 3.)
Striped Legless Lizard <i>Delmar impar</i>	DEW DECC	Vulnerable	Vulnerable	Unlikely to occur on the site. This species inhabits lowland native grasslands, typically dominated by native tussock forming grass

Species	Source	Status		Habitat present in study area
		NSW	National	
				species. (See specialist reptile report, Appendix 3.)
Rosenberg's Goanna <i>Varanus rosenbergi</i>	DECC	Vulnerable	-	Unlikely. A ground foraging goanna, this species inhabits sclerophyll forests and heathlands. The nearest known record is at Khancoban, 115km to the east (M. Mulvaney, pers. comm. January 2007).
Hooded Robin <i>Melanodryas cucullata</i>	DECC	Vulnerable (Schedule 2)	-	Yes. This small bird is usually found to colonise large, structurally diverse habitat patches. It is known to frequent the vegetated rocky knolls across the landscape of the wider region. Recorded at Morgans Ridge (Herring 2001, 2002).
Pink Robin <i>Petroica rodinogaster</i>	DECC	Vulnerable	-	Yes. It inhabits rainforest and tall, open eucalypt forest, particularly densely vegetated gullies. It has been recorded at Morgan's Ridge (Herring 2001).
Barking Owl <i>Ninox connivens</i>	DECC	Vulnerable (Schedule 2)	-	Yes. Barking Owls have large home ranges (Recovery Plan 2003) where they forage for possums, rabbits, large insects and birds. They forage along better vegetated creeklines and fringes of hillside vegetation. This is suitable habitat.
Powerful Owl <i>Ninox strenua</i>	DECC	Vulnerable	-	Yes. Powerful Owl pairs occupy large, probably permanent, home ranges in mountain forests, gullies and forest margins and sparser hilly woodlands (Pizzey & Knight 2003). Recordings have been made in nearby Woomargama NP (NSW Wildlife Atlas 2007).
Masked Owl <i>Tyto novaehollandiae</i>	DECC	Vulnerable	-	Unlikely. This is a forest owl which often hunts along roadsides on forest edges. Although the habitat appears suitable there are no known recordings of this species in the Greater Hume LGA (NSW Wildlife Atlas 2007; Herring 2001, 2002).
Grey Falcon <i>Falco hypoleucos</i>	DECC	Vulnerable (Schedule 2)	-	Unlikely. This species' habitat requirements include lightly treed inland plains, gibber deserts, sandridges, pastoral lands and timbered watercourses (Pizzey & Knight 2003). There is a recording of this species in the Jindera area (NSW Wildlife Atlas 2007) which is most likely to be that of a rare, nomadic visitor.
Square Tailed Kite <i>Lophoictinia isura</i>	DECC	Vulnerable	-	No. This species has a preference for timbered watercourses.
Black-chinned Honeyeater <i>Meliphreptus gularis gularis</i>	DECC	Vulnerable (Schedule 2)	-	Yes. This honeyeater, with its characteristic call, forages on flowering eucalypt species. It was heard during the survey.
Painted Honeyeater <i>Grantiella picta</i>	DECC	Vulnerable	-	Yes. This species forages on mistletoe. There are recordings from the nearby Table Top area (NSW Wildlife Atlas 2007).
Australasian Bittern <i>Botaurus poiciloptilus</i>	DECC	Vulnerable (Schedule 2)	-	No. This species inhabits dense vegetation such as reed beds in wetlands. This site is not suitable habitat.
Bush Stone-curlew <i>Burhinus grallarius</i>	DECC	Endangered (Schedule 1-Part 1)	-	Yes. This large, long-legged woodland bird was once relatively common across much of the state but is now only rarely recorded throughout central and western NSW and along the east coast. It resides in a broad range of habitats, including grassy open woodlands, much of which has been cleared for agriculture and urban development. Other factors contributing to its decline are its susceptibility to introduced predators,

Species	Source	Status		Habitat present in study area
		NSW	National	
				particularly foxes, and its low breeding success in disturbed environments. "The Bush Stone-curlew nests and forages on the ground and is easily recognized if observed or heard. However, because of its camouflaged plumage and cryptic behaviour, it often avoids detection." (NSW DECC <i>Draft NSW Recovery Plan for the Bush Stone Curlew 2003</i>).
Diamond Firetail <i>Stagonopleura guttata</i>	DECC	Vulnerable (Schedule 2)	-	Yes. The habitat of this small grass-seed eating finch is primarily grassy woodlands, where it nests in dense, often prickly shrubs, and forages on the ground for various native grass seeds. A pair of Diamond Firetails was observed in the subject site.
Brown Treecreeper <i>Climacteris picumnus victorae</i>	DECC	Vulnerable (Schedule 2)	-	Yes. This species is dependant on large patches of woodland or well connected streamside vegetation, where it forages for insects on the trunks and branches of trees and on the ground below trees and on fallen logs (Walters et al. 1999). There are recordings of this species at Morgans Ridge (Herring 2001, 2002).
Grey-crowned Babbler <i>Pomatostomus temporalis temporalis</i>	DECC	Vulnerable (Schedule 2)	-	Yes. "The Grey-crowned Babbler inhabits open Box-gum woodlands on the slopes and Box-Cypress Pine and open Box Woodlands on the alluvial plains. They live in family groups which consist of a breeding pair and young from previous breeding seasons. They feed on invertebrates on the trunks and branches of eucalypts or on the ground, digging and probing amongst litter and tussock grasses. They build and maintain several conspicuous, dome-shaped stick nests about the size of a football in which they roost at night. They breed between July and February and young birds are fed by all other members of the group. Their territories range from 1-50 ha (usually around 10 ha) and are defended all year" (DECC NSW Threatened Species Profile – Grey-crowned Babbler 2005). Suitable foraging habitat was found on the site.
Regent Honeyeater <i>Xanthomyza phrygia</i>	DEW DECC	Endangered (Schedule 1- Part 1)	Endangered TSMF	Yes. Occurs mostly in box-ironbark forests and woodland. Feed trees include Eucalyptus albens (White Box), E. melliodora (Yellow Box), E. sideroxylon (Mugga Ironbark) and E. leucoxylon (Yellow Gum) (Garnett & Crowley 2000). Personal observations in the Albury area have revealed that the bird prefers sites of mixed vegetation species including ironbark, nests in the dense foliage of shrubs, trees or mistletoe and forages up to 400 metres away in remnant or planted trees and shrubs, and where water is located. Foraging habitats were available for this species
Squirrel Glider <i>Petaurus norfolcensis</i>	DECC	Vulnerable (Schedule 2)	-	Yes. The glider has been recorded nearby (Herring 2001, 2002). It is expected that it would move freely throughout the surrounding landscape where arboreal connectivity allows, and is likely to utilize the hollow bearing trees of the subject site for nesting and roosting.
Superb Parrot <i>Polytelis swainsonii</i>	DEW DECC	Vulnerable	Vulnerable	No. These birds are generally found west or north of this region or nearer to riverside habitat.

Species	Source	Status		Habitat present in study area
		NSW	National	
Swift Parrot <i>Lathamus discolor</i>	DECC DEW	Endangered (Schedule 1- Part 1)	Endangered TSMP MP	Likely. The Box-Gum Woodland provides suitable habitat.
Turquoise Parrot <i>Neophema pulchella</i>	DECC	Vulnerable (Schedule 2)	-	Yes. This bird inhabits woodland adjoining clearings, wooded hills and ridges, and timbered creeklines and farmland habitats. It has been recorded nearby (Herring 2001, 2002).
Gang Gang Cockatoo <i>Callocephalon fimbriatum</i>	DECC	Vulnerable (Schedule 2)	-	Yes. "This species undertakes seasonal and nomadic movements and may occur at random points. It requires large hollow bearing trees in which to breed (Gibbons 1999 and Gibbons & Lindenmayer 2000), usually in tall mature sclerophyll forests with a dense understorey close to water (Beruldsen 1980). It occurs in winter at lower altitudes in drier, more open eucalypt forests and woodlands (Shields and Crome 1992) and can be observed in urban areas including parks and gardens (Morcombe 1986)." (DECC NSW Threatened Species Profile 2005.) The author has observed the species in Stringybark trees at Woomoogarma and in introduced Hawthorn and other species at Albury. There is a recording at Morgans Ridge (Herring 2001, 2002).
Glossy Black Cockatoo <i>Calyptrorhynchus lathami</i>	DECC DEW	Vulnerable	Endangered	Yes. It inhabits open forest and woodlands where stands of She-oak species occur (on which it feeds) and large hollow bearing eucalypt trees provide nesting sites (DECC Threatened Species Profile 2005). Drooping She-oak is found on the subject site.
Olive Whistler <i>Pachycephala olivacea</i>	DECC	Vulnerable	-	No. This species mostly inhabits wet forests on ranges on the east coast (DECC Threatened Species Profile 2005). It is more likely to be found in ranges east of this site.
Speckled Warbler <i>Chthonicola sagittata</i>	DECC	Vulnerable (Schedule 2)	-	Yes. This small, sedentary ground feeding bird nests on the ground, often at the base of shrubs or trees. It depends on patches of structurally complex shrubs or ground litter. It is usually found on the perimeters of wooded hillsides (pers. obs.). This site provides suitable habitat and they have been recorded at Morgans Ridge (Herring 2001, 2002).
White-bellied Sea-eagle <i>Haliaeetus leucogaster</i>	DEW	-	TSMP MP	No. Given the absence of permanent water of large lowland rivers and lakes it is unlikely to use this area as habitat.
White-throated Needletail <i>Hirundapus caudactis</i>	DEW	-	TSMP MP	No. A Highly nomadic and dispersive species, which follows low pressure atmospheric pockets where it feeds on insects. It breeds in the northern hemisphere. Its aerial habitat would not be affected by the proposed development. There are no known recordings of the study area as a roost site.
Fork-tailed Swift <i>Apus pacificus</i>	DEW	-	MP	No. Usually seen in its aerial habitat as atmospheric fronts push through. There are no known recordings of the study area as a roost site.
Satin Flycatcher <i>Myiagra cyanoleuca</i>	DEW	-	TSMP MP	No. Its preference is for wet forested hillsides, valleys and gullies.
Rufous Fantail <i>Rhipidura rufifrons</i>	DEW	-	TSMP MP	No. Its preference is for dim, tall closed vegetation with continuous canopy.
Latham's Snipe <i>Gallinago hardwickii</i>	DEW	-	WSMP MP	No. This species forages in soft wet ground with tussocks, seepage below dams and dam

Species	Source	Status		Habitat present in study area
		NSW	National	
				fringes, irrigated areas and bogs. This site does not provide suitable habitat.
Painted Snipe <i>Rostratula benghalensis s. lat.</i>	DEW DECC	Vulnerable (Schedule 2)	WSMP MP	No. Its habitat is well vegetated shallows and margins of wetlands, dams, sewage ponds and wet pastures. This site does not contain suitable habitat.
Australian Painted Snipe <i>Rostratula australis*</i>	DEW	-	Vulnerable	No. As above.
Rainbow Bee-eater <i>Merops ornatus</i>	DEW	-	TSMP	Yes. This species and its nest tunnels were observed in the gully in the study area.
Brolga <i>Grus rubicunda</i>	DECC	Vulnerable	-	No. This species usually frequents swampy areas and this site is not suitable habitat.
Great Egret <i>Ardea alba</i>	DEW	-	TSMP	No. It prefers shallows of rivers, wetlands, sewage ponds, irrigation areas and larger dams.
Cattle Egret <i>Ardea ibis</i>	DEW	-	TSMP	No. This species prefers stock paddocks, pastures, croplands, garbage tips, wetlands and drains. There is some potential for odd birds to forage here during wetter seasons but better, larger areas of habitat are provided elsewhere. It breeds in swamp woodland.
Freckled Duck <i>Stictonetta naevosa</i>	DECC	Vulnerable	-	No. It prefers large, well vegetated swamps and moves to lakes in dry periods.
Blue-billed Duck <i>Oxyura australis</i>	DECC	Vulnerable	-	No. It prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation.
Greater/Eastern Long-eared Bat (South-eastern form) <i>Nyctophilus timoriensis</i>	DEW DECC	Vulnerable	Vulnerable	Unlikely. It roosts in a variety of habitats but its preference is for River Red Gum forest, semi-arid woodlands and savannahs. It also occurs in box/ironbark/Callitris open forests and Buloke woodland, and in tall mallee shrublands (DECC Threatened Species Profile 2005). This site does not provide its preferred habitat.
Great Pipistrelle or Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>	DECC	Vulnerable	-	No. These bats inhabit wet sclerophyll higher elevation eastern fall escarpments (DECC Threatened Species Profile 2005). The habitat of this site is most unsuitable.
Yellow-bellied Sheath-tail bat <i>Saccolaimus flaviventris</i>	DECC	Vulnerable	-	Unlikely. This fast flying bat has been recorded along the Murray and Murrumbidgee Rivers and their tributaries. It roosts in large tree hollows and forages high above the canopy for insects. There have been recordings in the Greater Hume Shire at Woomargama NP (NSW Wildlife Atlas December 2006). It was not recorded during surveys of this site (Grabham 2007) or nearby surveys (Herring 2001, 2001).
Large-footed Fish Bat <i>Myotis adversus</i>	DECC	Vulnerable	-	No. It is more likely to be found near to large bodies of water or rivers over which it forages.
Little Pied Bat <i>Chalinolobus picatus</i>	DECC	Vulnerable	-	Unlikely. It roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings in dry open forest, open woodland and cypress-pine forest. Previously recorded with the Greater Hume Shire near Culcairn (C. Grabham, pers. comm. December 2006).
Eastern Bent Wing Bat <i>Miniopterus schreibersii oceanis</i>	DECC	Vulnerable	Vulnerable	Yes. Identified at Morgans Ridge (Herring 2001, 2002). Anabat analysis (Grabham 2007) of calls at subject site tentatively identified this species (call overlapped with another species).
Golden Sun Moth <i>Synemon plana</i>	DEW	-	Critically Endangered	No. It is found in open grassy woodlands on low phosphorus soils which are dominated by Wallaby grass tussocks. This is unsuitable

Species	Source	Status		Habitat present in study area
		NSW	National	
				habitat.
Spot-tailed Quoll <i>Dasyurus maculatus</i>	DEW DECC	Vulnerable	Endangered	Unlikely. Quolls require large areas of rocky habitat which provide den sites. Most of the rock on this site is embedded, with no caves. This species uses latrine sites to mark its territory. On rocks near to where wombats had tunnelled, quoll scats were searched for but none was found. There is a recording from near to Woomargama NP but there are no known recordings in the Morgans Ridge area.
Konoom, Smoky Mouse <i>Pseudomys fumeus</i>	DEW	-	Endangered	No. Its preferred habitat is ridge top sclerophyll forest with a diverse understorey of heath, dominated by legumes. The habitat of the study area does not provide the preferred understorey.
Brush-tailed Phascogale <i>Phascogale tapoatafa</i>	DECC	Vulnerable	-	Unlikely. Although the study area contains dry sclerophyll forest this species is almost always found in association with Stringybark trees, the bark of which it uses to construct its nests. One Stringybark was observed in the study area. This would not provide adequate resources.
Eastern Pigmy possum <i>Cercartetus nanus</i>	DECC	Vulnerable	-	Yes. This species occurs mainly at mid to high elevations from 300m to above 1,000m above sea level (DECC Threatened Species Profile 2005). It has been recorded nearby at the Yambula Range and east of Woomargama NP in sclerophyll forest and woodland (NSW Wildlife Atlas 2007) but its preferred habitat is heath and woodland.
Koala <i>Phascolarctos cinereus</i>	DECC	Vulnerable	-	No. The nearest known recordings are at Mullengandra & Woomargama NP. No scats or scratchings were observed on the trees of the study area and koala feed tree species did not make up >15% of the vegetative cover of the study area.
Murray Cod <i>Mucullocheila peelii peelii</i>	DEW	-	Vulnerable	No. It requires deep pools and permanent water bodies.
Macquarie Perch <i>Macquaria australasica</i>	DEW F DECC	Vulnerable	Endangered	No. They are found in river and lake habitats, especially the upper reaches of rivers and their tributaries where they spawn in shallow waters.
Trout Cod <i>Maccullochella macquariensis</i>	DEW DECC F	Endangered	Endangered	No. They are often found close to cover and in relatively fast currents, especially in fairly deep water close to the bank, and often congregate around snags. They tend to remain at the one site and have small home ranges. This site does not contain suitable habitat.
Silver Perch <i>Bidyanus bidyanus</i>	DECC F	Vulnerable	-	No. This species prefers fast flowing, open waters, where there are rapids and races, but also inhabit warm, sluggish water with cover provided by large woody debris and reeds. This site provides neither habitat type.
Southern Pygmy Perch <i>Nannoperca australis</i>	DECC F	Vulnerable	-	No. Found in vegetated areas in small streams, lakes, billabongs and other types of wetlands. This site does not provide potential habitat and does not lay on the floodplain.

5.2 Flora

Table 3: Summary of flora species of Conservation Significance known or predicted to occur within the Upper Slopes Murray CMA sub-region of the Greater Hume LGA

Species	Source	Status		Habitat present in study area
		NSW	National	
Narrow Goodenia <i>Goodenia macbarronii</i>	DEW DECC	Vulnerable	Vulnerable	No. It is recorded often in recently disturbed, seasonally damp, sandy soils in seepages, usually in shaded sites. The subject site is not a seepage.
Swamp Wallaby Grass <i>Amphibromus fluitans</i>	DEW DECC	Vulnerable	Vulnerable	No. This species grows mostly in permanent swamps, in swamp margins, mud, dam and tank beds in hard clay and in the semi-dry mud of lagoons. The subject site does not contain potential habitat.
Woolly Ragwort <i>Senecio garlandii</i>	DEW DECC	Vulnerable	Vulnerable	Yes. Suitable rocky slopes habitat is present so a comprehensive survey was completed but it was not found . Therefore it was not considered under the '7-part test'.
Phantom wattle <i>Acacia phasmoides</i>	DECC	Vulnerable	-	No. This species is recorded in the Woomargama NP (NSW Wildlife Atlas information, retrieved December 2006). The study area was searched for this species but it was not found.
Tricolour Diurus <i>Diurus sheaffiana</i>	EA	-	Vulnerable	No. It grows in sclerophyll forest amongst grass, often with <i>Callitris</i> . This site is not suitable habitat.
Slender Darling Pea <i>Swainsona murrayana</i>	DEW	-	Vulnerable	No. This often grows with <i>Maireana</i> species in heavy soils in depressions. This species would probably not be found in conditions found on this site.
Silky Swainson-Pea <i>Swainsona sericea</i>	DECC	Vulnerable	-	Unlikely. Although found in Box-Gum Woodlands this site is probably too degraded for it to be found here now.
Small Scurf-pea <i>Cullen parvum</i>	DEW DECC	Endangered	Endangered	No. There is a 1967 record from Jindera (NSW Wildlife Atlas 2006). It has been found in grassland, River Red Gum Woodland, grazing country and table drains in Victoria. During drought conditions such as those during the survey it would not be found and although it survives below ground the impacts of grazing on this site probably preclude its survival. If it does remain in the area it would be more likely to be found in the roadside table drains of minor roads where there has been less disturbance.
Austral Pillwort <i>Pilularia novae-hollandiae</i>	DECC	Endangered	-	No. Austral Pillwort grows in shallow swamps and waterways, often among grasses and sedges, and in table drains. As it is likely to be ephemeral it would be unlikely to be found during the dry survey period, however the high degree of disturbance at this site probably precludes its occurrence here.
Crimson Spider Orchid <i>Caladenia concolor</i>	DEW DECC	Endangered (Schedule 1, Part 1)	Vulnerable	Unlikely. Recorded on granite ridgelines at Nail Can Hill Albury. Extensive surveys by DECC were carried out in potentially suitable habitat areas including Holbrook but it was not found (NSW NPWS Draft Recovery Plan 2002).

Species	Source	Status		Habitat present in study area
		NSW	National	
Mueller Daisy <i>Brachyscome muelleroides</i>	DECC DEW	Vulnerable	Vulnerable	No. This species grows in seasonally inundated shallow depressions and heavy, cracking soils around lagoons (Australian Daisy Study Group 1995). This is not suitable habitat.
Yass Daisy <i>Ammobium craspedioides</i>	DEW DECC	Vulnerable	Vulnerable	Unlikely. It grows in sclerophyll woodland in the Yass district (DECC Threatened Species Profile 2006) however there are no known records in the Murray CMA (NSW Wildlife Atlas 2006). None was found on the subject site.
Austral Toadflax <i>Thesium australe</i>	DEW	-	Vulnerable	Unlikely. It grows in grassland or woodland, usually in damp sites, and usually associated with Kangaroo grass. There is no Kangaroo grass on the site

5.3 Ecological Communities

Table 4: Summary of Endangered/Threatened Ecological Communities known or predicted to occur within the Upper Slopes Murray CMA sub-region of the Greater Hume LGA

Species	Source	Status		Habitat present in study area
		NSW	National	
White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grasslands	DEW	-	Critically Endangered	No. Whilst the isolated trees on Zone 1 of this site formerly belonged to this endangered ecological community, the understorey cover and species diversity does not meet the Commonwealth listed criteria.
White Box-Yellow Box-Blakely's Red Gum Woodland	DECC	Endangered (Schedule 1 - Part 3)	-	Yes. Zone 1 of this site has the potential for assisted natural regeneration of the overstorey and understorey. That is, it meets the NSW legislative criteria for the EEC.
Aquatic ecological community in the natural drainage system of the lower Murray River catchment	DECC F	Endangered	-	No. There is no aquatic ecological community (AEC) in the study area. The Lower Murray ecological community occurs in a lowland riverine environment characterised by meandering channels and wide floodplains, including wetlands and terrestrial areas which experience floods and droughts where many species rely on suitable breeding habitat. The range of habitats include pools, runs or riffles, backwaters and billabongs, snags, and aquatic plants. Natural creeks are part of the habitat within this ecological community. A perennial watercourse lies west of & adjacent to the subject site within the title property boundary, where the lower reach forms an underground flow. The watercourse does not meet the listed criteria for the AEC.

5.4 Declining woodland birds in New South Wales

"A number of studies and reviews have documented major declines in temperate woodland birds in southern Australia. There is a strong consensus amongst woodland ecologists and field naturalists that woodland birds are undergoing a major and rapid wave of declines, including many local, regional and statewide extinctions. The decline is occurring because of loss of the woodland community due to removal of habitat and through degradation. Probably more than 85% of the habitat of the temperate woodland bird community has been completely removed and almost all of the remaining habitat has been degraded by grazing, logging, partial clearing or weed invasion" (Oliver 1998).

Table 4 lists the birds of conservation concern in the region and their presence or potential for presence in the study area. It is important to note that while 15 of the declining woodland bird species recorded within the Greater Hume LGA are not listed under the TSC Act 1995, most are listed as of some conservation concern and could potentially become 'threatened' if appropriate management of remaining habitat is not undertaken.

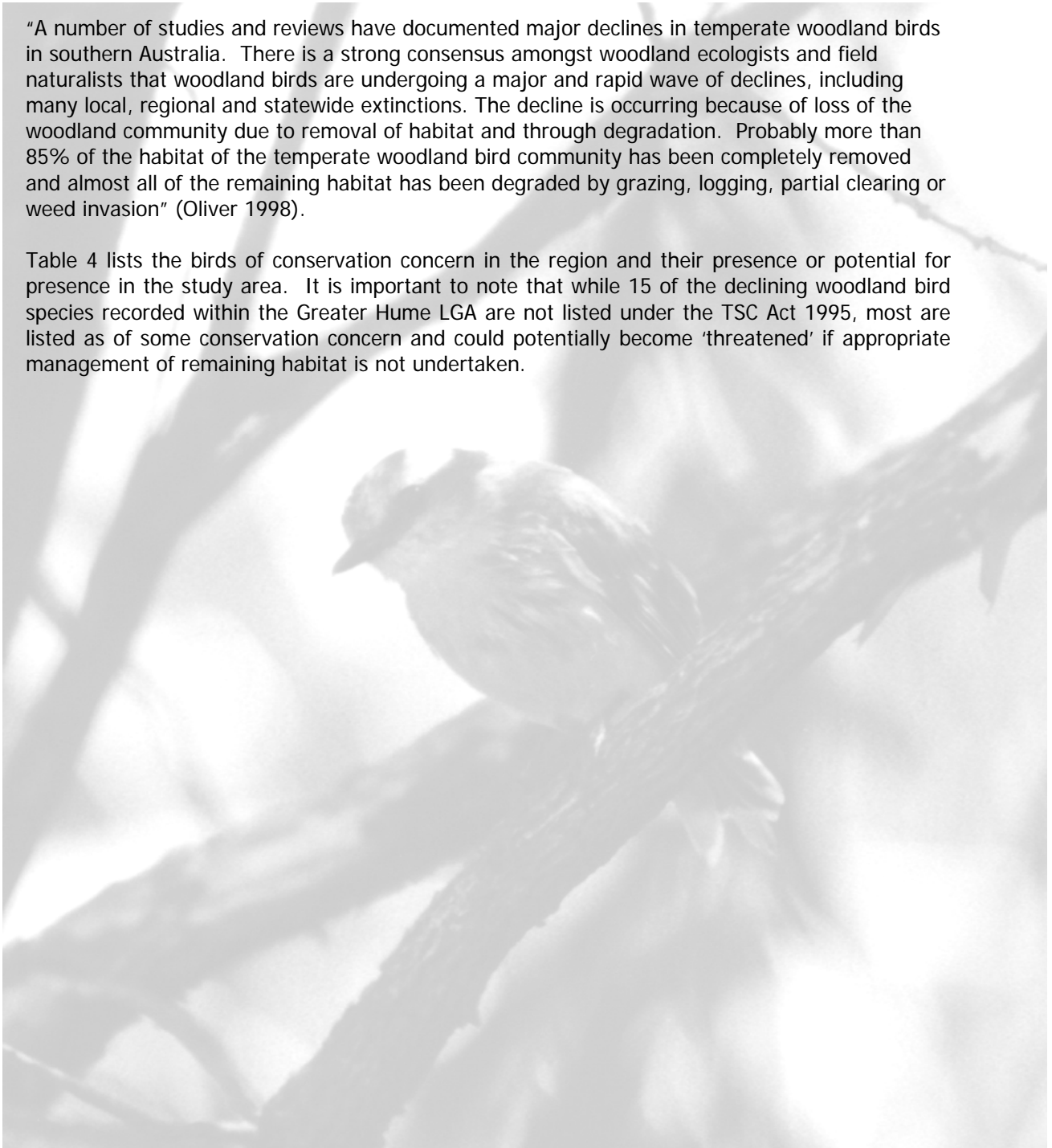


Table 5: Declining woodland birds in NSW

Species Name	(Recorded in the study area or with the potential to utilize the habitat)	Recorded previously in Greater Hume LGA
Bush-stone Curlew (TS)	PH	Yes
Emu	?	?
Painted Button-quail	PH	Yes (recorded at Morgans Ridge)
Spotted Nightjar	PH	?
White-browed Treecreeper	X	No
Chestnut-rumped Thornbill	X	Yes
Black-chinned Honeyeater (TS)	Yes (recorded at site)	Yes
Brown Treecreeper (TS)	PH	Yes (recorded at Morgans Ridge)
Speckled Warbler (TS)	PH	Yes (recorded at Morgans Ridge)
Southern Whiteface	Yes (recorded at site)	Yes
Jacky Winter	Yes (recorded at site)	Yes
Red-capped Robin	Yes (heard at site)	Yes
Hooded Robin (TS)	PH	Yes (recorded at Morgans Ridge)
Eastern Yellow Robin	Yes (heard at site)	Yes
Grey-crowned Babbler (TS)	X	Yes
White-browed Babbler	X	Yes
Varied Sittella	PH	Yes
Crested Shrike-tit	PH	Yes
Rufous Whistler	Yes (recorded at site)	Yes
Restless Flycatcher	Yes (recorded at site)	Yes
White-browed Woodswallow	PH	Yes (recorded at Morgans Ridge)
Dusky Woodswallow	Yes (recorded at site)	Yes
Diamond Firetail (TS)	Yes (recorded at site)	Yes

Key:

Yes = recorded within vegetation/habitat type during surveys
 PH = habitat/vegetation type considered to be potential habitat for that species
 X = species not recorded during surveys and vegetation habitat type not considered to be potential habitat
 (TS) = threatened species listed under TSC Act

Sources: Reid 1999 & 2000; Trail & Duncan 2000; Garnett & Crowley 2000 and The Wilderness Society website.

6.0 ASSESSMENT OF SIGNIFICANCE

In Section 5 a summary of fauna and flora species and ecological communities of conservation significance recorded from within the Greater Hume Local Government area was listed, including an assessment of preferred habitat. Where the species or habitat is known or likely to occur, an 'Assessment of Significance' has been undertaken and is provided below for the relevant species and/or the EEC. Therefore, as per details provided in Section 5, this assessment has been undertaken for the following species and EECs:

Table 6:

Endangered Ecological Community	Box-Gum Woodland
Fauna	
<i>Birds</i>	Barking Owl
	Black-chinned Honeyeater
	Brown Tree Creeper
	Bush Stone Curlew
	Diamond Firetail
	Gang Gang Cockatoo
	Glossy Black Cockatoo
	Grey-crowned Babbler (eastern subspecies)
	Hooded Robin
	Painted Honeyeater
	Pink Robin
	Powerful Owl
	Regent Honeyeater
	Speckled Warbler
	Swift Parrot
	Turquoise Parrot
<i>Mammals</i>	Eastern Pygmy Possum
	Eastern Bent wing bat
	Squirrel Glider

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

- **Eastern Pygmy Possum**

Unlikely because:

- Woodlands and heath with shrubby, nectar providing, myrtaceous species are the preferred habitat of this species, therefore 'Zone 3' and the adjoining habitat of Cromer Hill provide a better structured, complex habitat of higher resource value which, in the study area, is more likely to be utilized than the habitat of the subject site. These adjoining areas will be retained.
- The connectivity between Zone '3' and Cromer Hill is to be retained, protected and enhanced. With a home range of about 0.35-0.68ha (DECC 2005), it is likely that any viable population would be able to successfully complete its life cycle by moving between 'Zone 3' and Cromer Hill.
- Eight large live trees and four stag trees, as well as juvenile trees, are scattered across 'Zone 1'. Of these, four contain hollows. Whilst these trees are not marked for removal, it

can be expected that, over time, they will deteriorate because soil overburden from the quarry will be dumped into this area and is likely to impact upon root zones. Other hollow-bearing trees nearby have been fenced out of 'Zone 1' for protection and are now incorporated into 'Zone 3'. Whilst there is some potential for the Eastern Pygmy Possum to utilize the habitat of the trees in 'Zone 1' it is unlikely that, because of the reasons stated in (i) and (ii) above, the decline in tree health will create an adverse effect on its life cycle to the extent that a viable local population of the species is likely to be placed at risk of extinction.

- **Eastern Bentwing Bat**

The loss of hollow bearing trees and foraging habitats which are being cleared for residential and agricultural developments, including clearing by residents within rural subdivisions, predation by cats, and the application of pesticides in or adjacent to foraging areas are the greatest risks to the lifecycles of bat species (DECC NSW Threatened Species Profile 2005).

In this region, this species forages over large areas of dry sclerophyll forest and grassy woodland including agricultural pastures. It disperses readily throughout the landscape, at night, concentrating on aerial foraging, catching and feeding on moths, beetles and other insects whilst on the wing. It is known to breed and roost in caves, derelict mines, storm-water tunnels, buildings or other man-made structures. Because it has been recorded in the study area as well as at Morgans Ridge, it is likely that (at least) roosting habitat is provided somewhere at Morgans Ridge.

Blasting activities are proposed to be conducted during daylight hours, on average once per month. Based on the field observations, the site does not provide suitable breeding or roosting habitat for this species. It is likely that this species would only use the subject site as part of its overall foraging habitat area, during the hours of darkness.

It is unlikely therefore that the proposed activity would significantly disrupt the lifecycle of the Eastern Bentwing Bat.

- **Speckled Warbler**

This small sedentary ground-dwelling bird forages on the fringes of forest and woodland areas. It builds dome shaped nests in tussock grasses at the base of shrubs and trees. It is dependant on patches of structurally complex shrubs and ground litter. Whilst the subject site provides some of this species' requirements, the gully area and the adjacent Cromer Hill provide much larger areas of suitable complex habitat where several sub-populations are likely to be found. Any sub-populations utilizing the subject site and Cromer Hill could be considered to be part of a larger Morgans Ridge population. It is known that Speckled Warblers have breeding territories of about 10ha (DECC 2005) and, an email from Janet Gardner, September 14, 2006 stated "that movements of up to 30km have been recorded for banded individuals (Baker et al. 1999) and use of revegetated sites up to 3.5km from source populations, measured as remnants > 5ha in size have also been documented (Bond 2004)". Because the subject site is to be excavated in stages, any sub-population would readily disperse to other nearby habitat. The >40% decline in population densities has occurred where no vegetation remnants larger than 100ha survive (DECC NSW Threatened Species Profile 2005). Morgans Ridge habitat area is approximately 1100 ha. The removal of habitat from the subject site would therefore not place any viable local population at risk of extinction.

- **Glossy Black Cockatoo**

Locally nomadic (NSW NPWS 1999), this uncommon but widespread Cockatoo feeds almost exclusively on the seeds of she-oak, shredding the cones with its massive bill. It is dependant on large, hollow bearing trees for nest sites (DECC NSW Threatened Species Profile 2005). A number of regenerating young she-oaks are located on the higher elevations of the subject site.

No large parent trees were found there. Numerous she-oaks were observed though binoculars on the adjacent slopes of Cromer Hill. This species is usually seen in pairs or small groups. Habitat loss is the major reason for the decline of this species. The removal of the habitat from the subject site would not place the species at risk of extinction because of the larger food source nearby and the fact that there are no known nest tree sites for this species in the nearby study area.

- **Gang Gang Cockatoo**

"In summer the Gang Gang Cockatoo occupies tall montane forests and woodlands, particularly wet sclerophyll forests where it breeds in hollows in trunks of large limbs of large trees close to water. In winter it moves to lower altitudes. It is likely that the loss and degradation of habitat caused by clearing and burning have caused significant declines in its populations and it is likely to become endangered unless factors threatening its survival cease" (DECC NSW Threatened Species Profile 2005).

In winter small flocks move across the broader landscape (pers. obs.). "They return each day to the same shrub or tree until the food supply is exhausted. They feed mainly on seeds of native trees and shrubs including eucalypts, acacias and cypress pine as well as introduced species such as Cotoneaster and Hawthorn and conifers" (Readers Digest 1979, p254.).

The subject site does not provide its summer nesting requirements. Cromer Hill and Morgans Ridge contain a much greater area of foraging habitat than the subject site therefore the loss of habitat at the subject site is unlikely to place populations of this species at risk of extinction.

- **Turquoise Parrot**

This rare, grass seed eating parrot lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland where it prefers to feed on the ground in the shade of trees. It nests in tree hollows, logs or posts. The incremental loss of woodland such as that on the subject site, as well as heavy grazing of habitat, firewood collection and exotic pasture establishment are threats to its survival.

On the subject site, 'Zone 1' provides a more degraded habitat than that of the adjoining 'Zone 3' and the west facing slope of the remainder of the study area. In the locality the Turquoise Parrot is likely to prefer the west facing fringe of Morgans Ridge, 'Zone 3' and the aforementioned west facing slope of the study area, where patches of grassy understorey remain. Blasting is proposed in the area outside the Box-Gum Woodland zone. Whilst noise will occur during blasting operations it will not be sustained and the Turquoise Parrot is likely to disperse away from the subject site during this activity. The habitat provided in 'Zone 2' is an adjunct to habitat provided north and west of the subject site. Whilst trees in 'Zone 1' are likely to be impacted upon over time by the proposed development, the majority of trees containing hollows suitable for Turquoise Parrots are to be protected by being fenced out from 'Zone 1' and incorporated into 'Zone 3' where they will be retained. As any population of this bird is likely to disperse readily to similar adjoining habitat there will be no adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

- **Swift Parrot**

The Swift Parrot is a winter migrant to mainland Australia. It breeds in summer in Tasmania. On the mainland, its main habitat is Box-Ironbark Forest and Box-Gum Woodland where it feeds on lerp and nectar of Golden Wattle and Eucalypts such as White Box, Yellow Box and Ironbark. The removal of paddock trees and remnant vegetation containing key eucalypt feed trees are threats to the species. The Swift parrot is a highly mobile species and is able to utilise a variety of nectar sources over large areas. It returns to home foraging sites on a cyclic basis depending on food availability (DECC 2005). Because of its large feeding range and because it breeds in summer in Tasmania, the author considers the proposed activity is not considered likely to place a viable local population at risk of extinction.

- **Brown Tree Creeper**

This treecreeper has a home range of between 1.1-10ha, comprised of a pair or breeding group of 2-5 birds (DECC 2005). In the study area, Zones '1' and '3', along with the west facing slope adjoining the subject site provide potential habitat throughout which the species is likely to forage. There is also some potential for this species to forage into and move across 'Zone 2', which is to be removed in stages. The species nests in hollows of trees and fallen limbs.

There will be no risk of extinction of the local population because the majority of the potential habitat areas, including hollow bearing trees within the study area and adjoining areas, are to be retained. As the Brown Treecreeper is able to disperse readily, the proposed activity should not present an adverse effect.

- **Diamond Firetail**

In the study area, Zones '1', '2' and '3' are potential habitat areas for this species. Of these zones, 'Zone 2' is likely to be providing the larger part of a local population's foraging area, along with similar habitat contained in private properties to the north and south. There is some potential for it to nest in 'Zone 2' but nesting is more likely to occur in 'Zone 3', and in the adjoining Cromer Hill and Morgans Ridge area, because of their more diverse vegetative structure. The loss of foraging habitat in the study area is the effect most likely to impact upon this species, although there remains similar adjoining habitat to which the bird can disperse. Therefore it is unlikely to be placed at risk of extinction.

- **Bush Stone Curlew**

The NSW Wildlife Atlas does not contain any record for this species in the locality. Herring, in his studies at Morgans Ridge during 2001 and 2002, did not record the species. In the study area, however, potential habitat is provided in Zones '1' and '3' and to a lesser degree, in 'Zone 2'. 'Zone 3' is to be retained along with selected areas of 'Zone 1'. This species nests on the ground in a small scrape, among fallen limbs or in open areas, where it can obtain a view over grasses for any potential predators. There is some potential for the species to utilize the habitat provided by fallen limbs beneath the large, hollow bearing trees contained within 'Zone 1' as roost or nest sites. It forages into open grassy areas at night.

The majority of large hollow bearing trees where fallen limbs lie beneath the canopies are to be retained and protected by fencing into 'Zone 3'. They are the sites which are more likely to be utilized for nesting. A local population is likely to use a mosaic of habitats and resources within an area to fulfill its needs throughout its lifecycle (*Draft Recovery Plan 2003*), therefore a local population would not be at risk because the majority of potential nest sites, foraging and roosting areas are likely to be spread across the adjoining study area.

- **Painted Honeyeater**

This species is known to forage on fruits of mistletoes. It nests in outer canopies of Eucalyptus and mistletoe branches. The trees of Zones '1', '2' and '3' as well as Cromer Hill contain mistletoe clumps. The many isolated paddock trees adjoining the study area also contain mistletoe infestations. Because the species is nomadic, and because the availability of mistletoe across the region is a much greater resource than that of the subject site, disturbance of the subject site is unlikely to place it at risk of extinction.

- **Black-chinned Honeyeater**

This species forages on nectar and insects of trees in dry open forest and woodlands dominated by box and ironbark trees, in pairs or groups of up to 12, over large home ranges of at least 5ha. Potential habitat of the subject site is well represented in the study area and surrounding locality. Therefore the proposal is unlikely to cause risk of extinction to a local population.

- **Regent Honeyeater**

This species was not recorded during surveys. There are no known recordings for this species in the study area. There are three known key breeding areas for the Regent Honeyeater. Two of these areas occur in New South Wales (the Capertee Valley and Bundarra-Barraba regions) where large flocks have been known to converge. (A small population has also been known to breed at Albury.) Regent Honeyeaters inhabit woodlands with large numbers of mature trees, high canopy cover and an abundance of mistletoe. The subject site is not a known breeding area and whilst some habitat resources can be found scattered across the site, the adjoining sclerophyll forest of Morgans Ridge as well as the numerous scattered trees across adjoining agricultural land would provide more abundant resources. Important resources necessary for the life cycle of this species are unlikely therefore to be significantly affected by the proposed action such that a viable local population of the species is likely to be placed at risk of extinction.

- **Grey-crowned Babbler**

There are no known recordings for this species in the study area and it was not recorded during surveys. Studies were conducted during this species' breeding period when the Box-Gum Woodland habitat was searched for the conspicuous dome-shaped nests but none was found, therefore it is unlikely that the Babbler breeds in the study area. The adjoining Morgans Ridge provides a much larger area of potential habitat than the subject site. If the species does forage into the subject site it could readily disperse to those other habitat areas. The proposed action is unlikely to have an adverse effect on the life cycle of this species.

- **Powerful Owl**

The nearest known recording for this species is in the Woomargama National Park (NSW Wildlife Atlas 2007). The Powerful Owl requires large tracts of between 400 to 1,450ha of forest or woodland habitat where it forages during darkness for prey such as gliders, possums and birds. Morgans Ridge comprises approximately 1,100ha of potential habitat. The owl has a high fidelity to a small number of hollow-bearing nest trees where hollows are at least 0.5m deep and is extremely sensitive to disturbance around the nest site (DECC NSW Threatened Species Profile 2005). This owl is unlikely to nest in the subject site, or near to it, because the trees there do not appear to contain apertures which would contain hollows of this dimension. Any loss of potential foraging habitat caused by the proposed activity would be unlikely to place any local population at risk of extinction because of its ability to forage across the larger potential habitat area of Morgans Ridge and along its fringes. Blasting activities would be unlikely to adversely effect the owl because they will be conducted on average once per month during daylight and the owl is a nocturnal forager.

- **Barking Owl**

The Barking Owl feeds on a variety of prey including invertebrates, birds and small mammals such as gliders, rodents and rabbits. Its territory ranges from 30 to 200ha (DECC factsheet 2005), therefore it is not reliant upon the subject site for foraging.

It nests in large hollow bearing trees and sometimes roosts in taller, denser vegetation such as that in parts of 'Zone 3'. The trees containing potential roosting and nesting hollows are to be retained.

The owl is nocturnal. Blasting activities will be diurnal and limited to on average once per month. Therefore it would be unlikely that there would be an adverse effect such that any local population would be at risk of extinction.

- **Pink Robin**

This species perches on tree branches and pounces onto prey on the ground. It inhabits rainforest, tall open eucalypt forest and densely vegetated gullies (DECC 2005). In the study area, the Pink Robin would be more likely to use the 'Zone 3' habitat along with that of Morgans Ridge where more densely vegetated gullies occur. Under the proposal, 'Zone 3' is to be

retained. Therefore disturbance to the subject site would not place any local population of this species at risk of extinction.

- **Hooded Robin** (south-eastern form)

The Hooded Robin requires structurally diverse habitats along with a tall native grass ground layer. It utilises 'shrubby' cover for perching and foraging into open patches. It has a territory range from approximately 10ha during the breeding season to 30ha in the non-breeding season (DECC 2005). There is some potential for the species to use Zones '1', '2' and '3' for foraging and/or breeding. However this habitat is well represented on Cromer Hill and Morgans Ridge where much larger areas of suitable habitat can be found which the Robin is already likely to be utilizing and to which it could readily disperse. Therefore any local population would not be placed at risk of extinction by the implementation of the proposed activity.

- **Squirrel Glider**

These small gliding possums are capable of gliding up to 80 metres from a tall tree but prefer 30–50 metres (van der Ree et al. 2003). This could enable them to move into the study area from the fringes of Morgans Ridge and Cromer Hill. Squirrel gliders feed on nectar and insects within the canopies of the eucalypts. The study area provides these resources, therefore the author considers that Squirrel Gliders are likely to utilise the study area including the subject site at times because the habitat is suitable. As the locality provides a large area of similar connecting habitat however the glider would not be reliant upon the subject site for foraging resources.

Gliders are however dependent upon tree hollows for nesting and roosting. The number of suitable tree hollows is likely to be the main limiting factor on the size of the glider population. In studies at Thurgoona, they swapped trees on average each 5 days and use up to 15 den trees over an 80 day period and when they moved to a tree that was approximately 250m from the tree they occupied the previous day (van der Ree 2003). Under the recommendations made in this report in Section 9, with agreement from the property owner and quarry manager, the majority of trees which provide potential habitat in the way of spouts with small openings and hollows are to be retained on the subject site (it should be noted when observed from the ground, hollows suitable for gliders are notoriously difficult to assess accurately) and protected and incorporated into 'Zone 3' by fencing.

The trees proposed for removal at the property entrance do not contain potential nesting or roosting hollows and although the gliding distance between the remaining trees at that location will be increased the potential gap in the corridor is not of sufficient distance to cause gliders to come to ground.

As a result, the proposed activity is unlikely to have an adverse effect on the life-cycle of the Squirrel Glider such that a viable local population is likely to be threatened with extinction.

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

There are no endangered populations of any threatened species in the study area.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- (i) **is likely to have an adverse effect on the extent of the ecological community such that its local³ occurrence is likely to be placed at risk of extinction, or**
- (ii) **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

In the study area, the EEC is confined to below the 360m AHD contour level of the private property in which the subject site is located.

On the subject site, 'Zone 1' contains an endangered Box-Gum Woodland ecological community. The total area of 'Zone 1' is 5.26ha and it is expected that most of this area over time, apart from that containing some identified trees (which are to be protected by fencing), will be affected by the dumping of soil overburden extracted as part of the proposed quarrying works. The 5.26ha EEC area is roughly 6% of the 85.17ha area of the EEC within the title property boundary (120ha less 29.58ha Rocky Scarps & Ranges vegetation type above the 360m AHD contour level, and less approximately 5.25ha existing quarry works area and residential home site area north of subject site = 85.17ha). Therefore the local occurrence is unlikely to be placed at risk of extinction.

Drainage of stormwater run-off from the subject site will be via channels along the access track leading to sediment ponds, therefore the proposed activity is unlikely to have an adverse effect on the ecological community (refer to the Concept Erosion and Sedimentation Control Plan contained in the main EIS report).

The EEC across the subject site is missing the major ecological components of the middle and lower storey vegetative layers and now contains an overstorey of scattered trees over a mostly introduced ground layer of pasture grasses and weeds. Within the EEC area, the tree numbers and sizes which are likely to be impacted upon are as follows: Blakely's Red Gum – 14 @ 20 to 59cm dbh, 3 @ 60 to 89cm dbh and 5 @ >90cm dbh, plus a stag tree; Red Box – 2 @ 60 to 89cm and one @ >90cm. There are also a number of saplings <20cm dbh which are likely to be impacted upon. These saplings have regenerated due to site disturbance some 30 years ago (evidenced by their location in soil overburden stockpiles) and from germination from windshed seed near the canopies of other larger trees. At the property entrance trees proposed for removal are: one Yellow Box @ 80cm dbh (measured below the bifurcation) and five White Box (one @ 45cm, one @ 50cm, one @ 60cm, one @ 70cm and one @ 80cm dbh).

Across the study area there are numerous trees of varying sizes which far exceed the number of trees likely to be impacted upon by the proposed activity (refer Appendix 7). Also, there are patches within the study area, but outside the subject site, where the ground layer composition is of a better quality than that of the subject site because it contains >50% native ground cover with a higher species diversity, e.g. the area immediately west of 'Zone 2'.

Therefore the local occurrence and composition of the EEC is unlikely to be placed at risk of extinction.

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

³ According to DECC Threatened Species Assessment Guidelines (2005), the "local" occurrence is the community that occurs within the study area (i.e. contained within the title boundary of the property) as opposed to the reference to "locality" in the remainder of this report, which refers to a 2km radius from the subject site.

Table 7:

Species effected	Amount of habitat to be removed	Extent of habitat to be retained in the study area (within the title property boundary)	Extent of other habitat⁴ in the locality (2km radius) with potential to be utilized (refer map, Appendix 10)	Estimate (%) of habitat in study area in relation to: (a) local distribution (2km radius); and (b) regional distribution⁵	Quality (1) & ecological integrity (2) of habitat to be removed⁶
Eastern Pygmy Possum	Up to 5.26ha	Up to about 50ha	About 340ha of Cromer Hill plus surrounding agricultural land where there is good connectivity between trees	(a) 15%+ (b) Unknown	(1) Medium (2) Zone 1 – Low
Eastern Bent wing bat	12.44ha	120 – 12.44ha = 107.56	340ha of Cromer Hill plus surrounding agricultural land	(a) 31%+ (b) Unknown	(1) Medium (2) Zone 1 – Low Zone 2 – Medium
Speckled Warbler	Up to 12.44ha	Approx. 6ha	As above plus fringes adjoining agricultural land	(a) 2%+ (b) Unknown	(1) Medium (2) Zone 1 – Low Zone 2 – Medium
Glossy Black Cockatoo	About 2ha containing several small stems of Drooping She-oak	Nil	Unknown. Scattered She-oaks on Part of Cromer Hill	(a) ? (b) Unknown	(1) Medium (2) Zone 2 – Low (refers to feed trees)
Gang Gang Cockatoo	Up to about 6ha containing up to 16 potential foraging trees	About 92ha containing numerous potential foraging trees	340ha on Cromer Hill plus scattered trees on surrounding agricultural land, particularly where clumped or forming strips	(a) 28% (b) Unknown	(1) Medium (2) Zone 1 – Low
Turquoise Parrot	Up to 12.44 ha	Up to about 50ha	340ha on Cromer Hill plus fringes of adjoining agricultural land	(a) 15% (b) Unknown	(1) Medium (2) Zone 1 – Low Zone 2 – Medium

⁴ Estimated habitat is based on aerial photo based interpretation of potential habitat areas for each species e.g. The Turquoise Parrot is known to use the fringe areas of forested slopes, so potential habitat areas in Box-Gum woodland fringes adjoining Cromer Hill and Morgans Ridge within a 2km radius was estimated. Note that this habitat removal is to be staged over 20 years, as the market demands and as development consent conditions require.

⁵ Information was sought from DECC and the Murray CMA re: the regional distribution of Box-Gum Woodland habitat, but the information was unavailable and it is presumed unknown.

⁶ Key to 1 – Quality of habitat to be affected (as defined by Box-Gum Woodland EEC benchmarks (See Section 4.3);
Key to 2 – Ecological integrity of habitat to be affected (See Section 4.4).

Species effected	Amount of habitat to be removed	Extent of habitat to be retained in the study area (within the title property boundary)	Extent of other habitat⁴ in the locality (2km radius) with potential to be utilized (refer map, Appendix 10)	Estimate (%) of habitat in study area in relation to: (a) local distribution (2km radius); and (b) regional distribution⁵	Quality (1) & ecological integrity (2) of habitat to be removed⁶
Swift Parrot	1 tree in 12.44ha	Up to 107ha	Scattered trees on adjoining agricultural land	(a) 31% (b) Unknown	(1) Medium (2) Zone 1 – Low
Brown Tree Creeper	Up to 12.44ha	Up to about 50ha	340ha on Cromer Hill plus fringes of adjoining agricultural land and along treed watercourses	(a) 15% (b) Unknown	(1) Medium (2) Zone 1 – Low; Zone 2 – Medium
Diamond Firetail	Up to 12.44ha	Up to about 50ha	340ha on Cromer Hill plus higher elevations of adjoining agricultural land where native grasses occur	(a) 15% (b) Unknown	(1)Medium (2)Zone 1 – Low; Zone 2 – Medium
Bush Stone Curlew	Up to about 7ha	Up to about 40ha	340ha on Cromer Hill plus adjoining agricultural land where fallen limbs have been retained beneath trees	(a) 12% (b) Unknown	(1) Medium (2) Zone 1 – Low
Painted Honeyeater	Up to 12.44ha	Up to 107.56ha	Within the full 2km radius of the subject site	(a) 32% (b) Unknown	(1) Medium (2) Zone 1 – Low; Zone 2 – Medium
Black-chinned Honeyeater	12.44ha	Trees within 107.56ha area	Within the full 2km radius of the subject site	(a) 32% (b) Unknown	(1) Medium (2) Zone 1 – Low; Zone 2 – Medium
Regent Honeyeater	Up to 12.44ha	Trees within 107.56ha area	Within the full 2km radius of the subject site	(a) 32% (b) Unknown	(1) Medium (2) Zone 1 – Low; Zone 2 – Medium
Grey-crowned Babbler	Up to 12.44ha	Up to about 50ha	340ha on Cromer Hill plus fringes of adjoining agricultural land and along treed watercourses	(a) 15% (b) Unknown	(1) Medium (2) Zone 1 – Low; Zone 2 – Medium
Powerful Owl	Up to 12.44 ha	Up to 107.56	340ha on Cromer Hill plus fringes of adjoining agricultural land	(a) 32% (b) Unknown	(1) Medium (2) Zone 1 – Low; Zone 2 – Medium

Species effected	Amount of habitat to be removed	Extent of habitat to be retained in the study area (within the title property boundary)	Extent of other habitat ⁴ in the locality (2km radius) with potential to be utilized (refer map, Appendix 10)	Estimate (%) of habitat in study area in relation to: (a) local distribution (2km radius); and (b) regional distribution ⁵	Quality (1) & ecological integrity (2) of habitat to be removed ⁶
Barking Owl	Up to 12.44ha	Up to 107.56	340ha on Cromer Hill plus fringes of adjoining agricultural land	(a) 32% (b) Unknown	(1) Medium (2) Zone 1 – Low Zone 2 – Medium
Pink Robin	Nil	About 2ha	Densely vegetated gullies on Cromer Hill	(a) <1% (b) Unknown	Nil to be removed
Hooded Robin	Up to 12.44ha	About 34ha	340ha on Cromer Hill plus adjoining fringes of agricultural land	(a) 10% (b) Unknown	(1) Medium (2) Zone 1 – Low; Zone 2 – Medium
Squirrel Glider	About 5.26ha	About 50ha	Base of Cromer Hill, & agricultural land along drainage lines & roadside corridors & where arboreal connectivity between these sites is <80m	(a) 15% (b) Unknown	(1) Medium (2) Zone 1 – Low

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

Whilst Box-Gum Woodland habitat in 'Zone 1' of the subject site will be modified, the surrounding habitat in 'Zone 3' will remain linked to the adjoining areas.

The Rocky Scarps and Ranges habitat found north of 'Zone 2' will remain linked to Cromer Hill via the existing vegetative cover between those areas.

Many bat species do not entirely rely on habitat connectivity. They are able to fly quite some distances e.g. up to 5km or more per night (pers. comm. C. Grabham). The surrounding landscape provides similar habitat and the local population could, and already would, disperse readily to that habitat for nightly foraging. The Eastern Bentwing Bat is a mobile species and generally non-reliant on continuous tracts of vegetation for movement. Given the extent and rate of removal of vegetation, it is unlikely that the proposed works would involve an area of habitat for the Eastern Bentwing Bat becoming fragmented or isolated from other areas of habitat. Given the mobile nature of bats and the relatively small area of resources within the subject site in terms of potential habitat in the local study area and the regional distribution of potential habitat, the proposed activity is unlikely to involve the removal of a significant area of bat habitat. It is likely that potentially suitable habitat is well represented within the surrounding locality.

Whilst all of the bird species are highly mobile and therefore able to cross between habitats on either side of the subject site as well as moving through the vegetated corridors, the Squirrel

Glider and Eastern Pygmy Possum rely on arboreal connectivity to move between roost sites and dens and foraging resources, and to maintain the gene flow to sustain a viable population. The connectivity between potential habitat areas is to be retained but consideration needs to be given to strengthening these links, and the recommendations made in Section 8 deal with this aspect.

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

- **Eastern Bent wing bat**

The study area is similar to the greater percentage of surrounding habitat, which is that of grazing land with scattered isolated trees across the landscape with a higher concentration of remnant trees in road reserve corridors. The loss of potential roost trees from the subject site would be unlikely to effect the long-term survival of the species, or local population unless this represented a large percentage of key roost trees. Observations of the study area and surrounding land indicated that there were many other trees containing the potential roosting habitat requirements of cracks, fissures and hollows. Morgans Ridge has the potential to provide caves and rock fissures as habitat.

- **Speckled Warbler/Turquoise Parrot/Brown Tree Creeper/Bush Stone Curlew/Powerful Owl/Barking Owl/Pink Robin/Hooded Robin**

All of these species are opportunistic feeders and whilst all, except the Pink Robin, are likely to forage into and across the subject site, they are much more likely to rely on the habitat of the adjoining Cromer Hill and Morgans Ridge. This 1,100ha (approx.) area contains a largely intact habitat resource of higher ecological integrity. That is, ignoring the recent bushfire event, it has a greater range of plant species, better vegetative structure of trees, shrubs and ground flora, contains a range of ages of woody plants, with a ground cover containing coarse woody debris such as fallen logs, small branches, twigs and leaf litter and, due to its steep terrain, has not been grazed as intensively as the subject site. It has a range of habitat types, such as rocky substrate, treed slopes and more densely vegetated gullies, creating more opportunities for foraging and nesting for the above species than the subject site. The modification of 'Zone 1' is unlikely therefore to be important to the long term survival in the locality of the above species and their populations.

- **Glossy Black Cockatoo**

This species is very specific in its habitat requirements. The subject site does not provide breeding sites and, on this site, the immature Drooping She-oaks on which it feeds would provide a very small part of its foraging habitat. Its long term survival in the locality would not depend on the habitat of the subject site.

- **Gang Gang Cockatoo**

Gang Gangs breed in the summer in the tall trees of montane forests. The subject site is likely to provide a very small part of its foraging area therefore is unimportant to its long term survival in the locality.

- **Swift Parrot**

After breeding in Tasmania during spring and summer, Swift Parrots return to mainland Australia to forage across broad landscapes in Box-Gum habitats during autumn and winter where they are reliant on abundant nectar supplies and lerp infestations. Winter flowering trees such as White Box and Yellow Box are their preferred foraging species in the region. As only one specimen of White Box occurs on the subject site, the subject site is not important to the species long-term survival in the locality.

- **Diamond Firetail**

This species would forage across most of the 12.44ha subject site, but particularly where native grasses occur at the highest density. This is across 'Zone 2'. A pair of Diamond Firetails was observed in 'Zone 2' during the study period. In the locality, native grasses occur at their highest density where grazing is less frequent and for shorter periods. So in the locality the grasses are found at their highest densities in rocky areas with a sparse canopy where stock has less accessibility. The subject site and the adjoining areas to the north and west, above the 360m contour, provides the best foraging habitat for this species. In the locality, other similar areas can be found in the adjoining property to the north, and along the fringes of Cromer Hill and Morgans Ridge, where this species is likely to forage at least as frequently as within the subject site. In the locality, the habitat on the subject site is important to the survival of the Diamond Firetail. In the short term, as 'Zone 2' habitat is to be removed in stages, there is unlikely to be a large impact and, as similar nominated adjoining areas are to be protected and enhanced for the Diamond Firetail and other species, in the longer term the Diamond Firetail habitat quality and quantity is likely to be enhanced. So the long-term survival of this species in the locality is unlikely to be affected by the proposed activity.

- **Painted Honeyeater**

This nomadic species relies on heavy mistletoe infestations in woodlands, farmland and gardens. It follows the fruiting of mistletoes across the broad landscape. Therefore the subject site is not important to its long-term survival in the locality.

- **Black-chinned Honeyeater**

This highly mobile species is able to move freely throughout the landscape wherever eucalypts are flowering or providing a source of insects. It builds its nests high in the crowns of trees. It tends to have a large home range of at least 5ha. It would disperse readily to other parts of the study area.

- **Regent Honeyeater**

This mobile species migrates seasonally across large areas to feed on nectar, lerp and honeydew from a wide range of eucalypts and mistletoes. It breeds in areas where dense cover (including shrubby understorey) provides nesting opportunities. 'Zone 3' (the watercourse area) and the base of Cromer Hill provide the most suitable potential nesting habitat in the study area. These areas are to be retained under the proposed action. Other parts of the study area outside the subject site comprise a much larger area of potential foraging habitat. Therefore the loss of 12.44ha of potential habitat under the proposed action is unlikely to effect the species' life cycle and is not important to the long term survival of the Regent Honeyeater in the locality.

- **Grey-crowned Babbler**

As nests were not found on the subject site it does not appear to be a breeding or roosting site for this species. For this reason, and because other similar larger areas of potential habitat which adjoin the study area are to be retained, the proposed action is unlikely to affect the reproductive success of this species.

- **Squirrel Glider**

The hollow bearing trees which are contained within 'Zone 1' of the subject site are likely to be important to the Squirrel Glider as part of their essential habitat. Without hollows this species is unable to roost, breed and raise young. Hollows take about 120 years to form in Box-Gum trees. They occur in large, old trees which are generally found on the more fertile soils at lower elevations. Because agricultural pursuits are conducted on these better soils, grazing and cropping pressures have meant that there is little regeneration and, along with past clearing practices, the consequence is that large, old, hollow-bearing trees are disappearing from the landscape. Therefore retention of hollow-bearing trees is essential. The proponent has excluded from development the majority of large hollow bearing trees which provide potential breeding and roosting habitat for this species. Two live trees and three stag trees bearing potential roosting and nesting hollows for the Squirrel Glider remain in the proposed development area, along with younger regenerating trees. These are likely to be impacted upon over time by a decline in health caused by the dumping of soil overburden from the quarry works area. Gliders have been observed to utilize hollows in dead or live trees (pers. obs., G. Datson). Therefore the decline in health of those trees is unlikely to impact upon the gliders' usage of these trees for denning and roosting purposes. The gliders are also likely however to utilize other potential habitat in the study area for denning, roosting and foraging and are unlikely to rely entirely upon the trees which are located in 'Zone 1' of the subject site. The trees are not 'link trees' but part of other potential habitat in the wider study area.

- **Box-Gum Woodland**

The 5.26ha woodland area in 'Zone 1' represents 6.15% of the 85.17ha of Box-Gum Woodland contained within the title property boundary (i.e. the area below the 360m AHD contour level). Within the locality (2km radius) there is approximately 880ha of Box-Gum Woodland (1,257ha less 340ha of Rocky Scarps & Ranges vegetation type on Cromer Hill and 29.58ha within the title property boundary and a smaller amount on the neighbouring property to the north). Therefore 'Zone 1' represents approximately 0.6% of the Box-Gum Woodland in the locality. Given the large scale clearing (95% in the Murray CMA and 90% in the region) all Box-Gum Woodland is important.

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

The study area has not been declared critical habitat for any species (DECC register of critical habitat).

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

Draft or approved Recovery Plans are in place for the following species:

- Barking Owl
- Powerful Owl
- Bush Stone Curlew
- Regent Honeyeater
- Swift Parrot

Priority actions recommended under these recovery plans and strategies for a wide range of threatened species and endangered ecological communities, whilst containing some differences across the range, are uniformly consistent in their objectives. These are:

- Habitat protection
- Ongoing habitat management
- Community and landholder liaison/awareness/education
- Habitat rehabilitation/restoration or regeneration
- Monitoring
- Control of feral predators and rabbits
- Avoidance of frequent burning of habitat
- Retention of linkages
- Avoidance of overgrazing by stock
- Avoidance of firewood collection in areas with good ground cover diversity
- Retention of dead trees/stumps and hollow bearing trees
- Facilitating an increase in remnant sizes

The proposed action is inconsistent with most of the above objectives. However the setting aside of appropriate land as an offset for habitat loss and management of that area for its biodiversity conservation values would be a valuable improvement.

A rehabilitation/regeneration/revegetation plan consistent with recovery plan objectives and the *Draft Threatened Species Priority Action Statement*, which sets out the measures required to promote the recovery of threatened species, populations and ecological communities, is recommended in Section 8 and a separate plan for that purpose is provided as an addendum to the Assessment of Significance.

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

The activity involves the:

1. Clearing of native vegetation: The clearing of native vegetation is listed as a key threatening process on Schedule 3 of the TSC Act.
2. Removal of dead wood and dead trees: This is also a listed key threatening process.
3. Potential loss of hollow bearing trees: This is a pre-listing only and does not have any legal effect but requires consideration.
4. Removal of bush rock: This is a key threatening process but for the purposes of the final determination, does not include: the removal of rock from approved mining or quarrying activities; the salvage of rock where the removal of the rock is necessary for carrying out a development or activity with an existing approval under the EP&A Act or the removal of rock from paddocks when it constitutes a necessary part of the carrying out of a routine agricultural activity.

"The clearing of native vegetation is recognized by the Scientific Committee of the DECC as a major factor contributing to loss of biological diversity. Clearing of any area of native vegetation, including areas less than two hectares in extent, may have significant impacts...Some examples of the impacts of the clearing of native vegetation on biological diversity are the destruction of habitat, fragmentation, loss of leaf litter layer, increased habitat for invasive species and changes to soil biota" (DECC 2005b).

"The removal of dead wood and dead trees includes the removal of forest and woodland waste left after timber harvesting, collecting fallen timber for firewood, burning on site, mulching on site, the removal of fallen branches and litter as general tidying up, and the removal of standing dead trees...Dead wood and dead trees provide essential habitat for a wide variety of native animals and are important to the functioning of many ecosystems. The removal of dead wood can have a range of environmental consequences, including the loss of habitat (as they often

contain hollows used for shelter by animals), disruption of ecosystem process and soil erosion. Removal of dead old trees (either standing or on the ground) results in the loss of important habitat such as hollows and decaying wood (Gibbons & Lindenmayer 2002) for a wide variety of vertebrates, invertebrates and microbial species and may adversely affect many threatened species" (DECC 2003).

"The loss of hollow-bearing trees occurs primarily as a result of clearing native vegetation for agriculture, unsustainable timber harvesting, forestry and urban development. Dieback, wildfires, and frequent burning cause loss and depletion of hollow-bearing trees. Competition for nesting hollows between introduced animals such as feral honey bees and starlings and native animals intensify the effects of losing hollow-bearing trees by limiting the availability of this resource" (DECC 2006).

Loss of foraging habitat has been identified by the DECC as a threat for several species.

The key threatening processes listed above are relevant to those species for which this assessment of significance has been undertaken. In order that these effects are limited, specific recommendations have been made and an agreement by the proponent has been undertaken to retain key identified hollow-bearing trees and, where possible, fallen limbs and twigs are also to be retained beneath these trees, with other coarse woody debris and some rock to be relocated to nominated adjoining areas.

7.0 CONCLUSIONS

One nationally listed migratory bird species, the Rainbow Bee-eater is utilizing sections of the banks of the watercourse for nesting habitat. Listed migratory species are a matter of national environmental significance under the EPBC Act's assessment and approval provisions. The Rainbow Bee-eater is under threat nationally because of disturbances to its nesting habitat (pers. comm. Department of Environment and Water Resources). The EPBC Guidelines for Significant Impact for migratory species set out the criteria for determining whether the matter should be referred to the Minister for a decision on whether assessment and approval is required under the EPBC Act. According to this set of criteria, the habitat on this site is not 'important habitat', the population at the subject site is not 'an ecologically significant proportion' of the species' population and, if the level of action proposed is below the 'significant impact' threshold (i.e. it will not cause impact to the species' nesting habitat during its breeding season between the end of September and March), then it will not be necessary to refer this matter to the Minister. Also, the Glossy Black Cockatoo, Superb Parrot, Swift Parrot, Regent Honeyeater and Eastern Bentwing Bat are listed under national legislation and have the potential to utilize the habitat of the subject site from time to time. The Assessment of Significance found that there is unlikely to be an impact on these species. Consequently, no additional approval is required from the Department of Environment and Water Resources (DEW).

Whilst the activity is unlikely to have a significant effect upon the threatened species and endangered ecological community for which the Assessment of Significance has been undertaken, the Diamond Firetail needs consideration.

The Diamond Firetail, listed under the NSW TSC Act, is the species most likely to be impacted upon by the proposed activity. Whilst its reproductive success is unlikely to be affected, the loss of its foraging habitat needs to be mitigated. As the proposed activity is to be staged over a 20 year period, and as the better foraging areas for the Diamond Firetail on the subject site will be

the last to be affected by the activity, enhancement of other foraging areas in the interim will be advantageous to the species. Therefore provided the setting aside and enhancement of an area for the Diamond Firetail is enacted in the short term, there will be no significant effect upon this species. The written part of the Rehabilitation and Native Vegetation Off-set Planting Plan contained in the main EIS report is provided as an addendum to this report (refer to Appendix 9). The recommendations contained at Section 8 are provided as guidelines to this Plan.

8.0 RECOMMENDED MITIGATION MEASURES

In order to reduce the impact of the proposal on native flora and fauna and their habitats that may occur in the subject site the following recommendations are made:

- Immediately prior to blasting activities, a loud 'warning' sound should be enacted in the quarry area. This should serve to flush bird species from the site.
- Off-set areas should be provided for the loss of habitat. There are two habitat types in the study area: Box-Gum Woodland and Rocky Scarps & Ranges complex. Offset areas to be agreed upon with the DECC should be set aside in perpetuity. These offset areas are delineated in the Rehabilitation and Native Vegetation Off-set Plan attached to the EIS.
- All off-set areas should be fenced for protection from grazing which will allow regeneration. (Grazing of off-set areas should be enacted only for fire hazard abatement purposes, when necessary, once per year for up to three weeks or only until the hazard is controlled. The optimum time to reduce this hazard is about the end of August (depending on seasonal conditions and the grass fuel load). By grazing when the introduced grasses are at their optimum growth stage the land manager can control the amount of seed set that occurs, thereby reducing the area taken up by these species and then, with the removal of stock, the native grass species are able to grow, set seed and regenerate. This grazing method is referred to as strategic grazing.)
By fencing out the grazing stock, native trees, shrubs, grasses and forbs can grow and regenerate. Introduced annual pasture grasses tend to grow, flower and set seed earlier in the season than native plants and grasses. This provides an opportunity to target and control the annual grasses.
- Protect the root zones of identified hollow bearing trees in 'Zone 1' by permanent fencing outside the driplines of the canopies (this will avoid the breaching of fences when limbs fall and will have the effect of incorporating these trees into 'Zone 3').
- Noxious and environmental weeds should be controlled through a weed management plan included in the Environmental Management Plan.
- Gates should be provided in fenced areas for maintenance purposes.
- In off-set areas, fallen limbs, leaf litter and dead trees should be retained insitu for habitat purposes.
- Feral animal control should be undertaken regularly.
- Nearby domestic cats should be controlled by confinement to homes at night or caged cat walk areas.
- The revegetating in selected areas with indigenous species, particularly understorey species.
- Corridor linkages should be strengthened where necessary by enhancement plantings and the placement of rock.
- The avoidance of the use of fertilizers near remnants.
- The avoidance of soil disturbance in or near remnants, such as ripping planting lines and road grading.
- The collection of nominated fallen limbs and twigs from beneath trees in 'Zone 2' and placement into adjoining habitat areas to allow their continuation as potential fauna refuge sites. This coarse woody debris should not be placed in heaps but spread in a fashion which replicates the natural environment.
- The retention of surface rock overlying exposed bedrock wherever possible.
- The construction of soil stockpile storage berms for soil extracted from the quarry area in a way which ensures there is no overflow into protected 'offset' areas.

The above recommendations include priority and threat abatement actions recommended by DECC for Box-Gum Woodland.

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Legend to Tables:

Source:

DEH – Dept. of Environment & Heritage Online Database local government area searcher.

DECC – NSW Department of Environment & Climate Change Threatened Species Database 2006.

Bionet – NSW Database 2006.

F – NSW Fisheries.

C. Grabham – Senior Ecologist, GHD Pty Ltd.

M. Herring – Wildlife ecologist.

D. Michael – Herpetologist, Ecotone Wildlife and Habitat Assessments.

Status:

NSW: identifies the legal status of species as listed under the NSW *Threatened Species Conservation Act 1995* and/or the NSW Fisheries Management Act 1994.

National: identifies the legal status of species as listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999*.

TSMP: Terrestrial species covered by migratory provisions of the EPBC Act 1999.

WSMP: Wetland species covered by migratory provisions of the EPBC Act 1999.

MP: Species covered by marine provisions of the EPBC Act 1999.

10.0 APPENDICES

Appendix 1: Fauna List

Appendix 2: Flora List

Appendix 3: Specialist Reptile Report

Appendix 4: Specialist Bat Report

Appendix 5: NSW DECC – Threatened flora and fauna list

Appendix 6: Commonwealth Protected Matters map search and report

Appendix 7: Proposed Work Area Plan

Appendix 8: Tree cover density within a 2km radius

Appendix 9: Rehabilitation and Native Vegetation Off-set Replanting Plan

Appendix 1: Fauna list

Type	Scientific name	Common name	Status
Bird	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill	Protected
	<i>Acanthiza lineata</i>	Striated Thornbill	Protected
	<i>Acanthiza nana</i>	Yellow Thornbill	Protected
	<i>Acanthiza reguloides</i>	Buff-rumped Thornbill	Protected
	<i>Aquila audax</i>	Wedge-tail Eagle (seen over Cromer Hill)	Protected
	<i>Aphelocephala leucopsis</i>	Southern Whiteface	Disappearing Woodland Bird
	<i>Artamus cyanopterus</i>	Dusky Woodswallow	Disappearing Woodland Bird
	<i>Colluricincla harmonica</i>	Grey Shrike-thrush	Protected
	<i>Corancina novaehollandiae</i>	Black-faced Cuckoo-shrike	Protected
	<i>Corcorax melanorhamphos</i>	White-winged Chough (nest observed in gully)	Protected
	<i>Cormobates leucophaeus</i>	White-throated Treecreeper (in gully)	Protected
	<i>Corvus coronoides</i>	Australian Raven	Protected
	<i>Cracticus nigrogularis</i>	Pied Butcherbird	Protected
	<i>Dacelo novaguineae</i>	Laughing Kookaburra	Protected
	<i>Dicaeum hirundinaceum</i>	Mistletoe bird	Protected
	<i>Eopsaltria australis</i>	Eastern Yellow Robin (in gully 'Zone 3')	Disappearing Woodland Bird
	<i>Geopelia placida</i>	Peaceful Dove	Protected
	<i>Falco cenchroides</i>	Nankeen Kestrel	Protected
	<i>Geophaps lophotes</i>	Crested Pigeon	Protected
	<i>Gerygone olivacea</i>	White-throated Gerygone	Protected
	<i>Glossopsitta pusilla</i>	Little Lorikeet	Protected
	<i>Gymnorhina tibicen</i>	Australian Magpie	Protected
	<i>Lichenostomus pencilatus</i>	White-plumed Honeyeater	Protected
	<i>Malurus cyaneus</i>	Superb Blue Wren	Protected
	<i>Manorina melanocephala</i>	Noisy Miner	Protected
	<i>Melithreptus brevirostris</i>	Brown-head Honeyeater	Protected
	<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater	Threatened species
	<i>Merops ornatus</i>	Rainbow Bee-eater	Commonwealth Listed Terrestrial Migratory Species
	<i>Microeca fascians</i>	Jacky Winter	Disappearing Woodland Bird
	<i>Myiagra inquieta</i>	Restless Flycatcher	Disappearing Woodland Bird
	<i>Oriolus sagittatus</i>	Olive-backed Oriole	Protected
	<i>Pachycephala rufiventris</i>	Rufous Whistler	Threatened Woodland Bird
	<i>Pardalotus striatus</i>	Striated Pardalote	Protected
	<i>Petroica goodenovii</i>	Red-capped Robin (heard off site at Cromer Hill)	Disappearing Woodland Bird
	<i>Platycercus eximus</i>	Eastern Rosella	Protected
	<i>Psephotus haematonotus</i>	Red-rumped Parrot	Protected
	<i>Rhipidura leucophrys</i>	Willy Wagtail	Protected
	<i>Smicromis brevirostris</i>	Weebill	Protected
	<i>Stagonopleura guttata</i>	Diamond Firetail	Threatened species
	<i>Sturnus vulgaris</i>	Common Starling	Introduced pest
Mammal			
	<i>Lepus capensis</i>	Brown Hare	Introduced pest
	<i>Macropus giganteus</i>	Eastern Grey Kangaroo	Protected
	<i>Trichosurus vulpecula</i>	Brush-tail Possum	Protected
	<i>Vombatus ursinus</i>	Wombat	Protected
	<i>Vulpes Vulpes</i>	Red Fox (scats)	Introduced pest. Key threatening process
	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	Protected
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat	Protected
	<i>Miniopterus schreibersii</i>	Large Bentwing Bat	Protected
	<i>Mormopterus planiceps (lpf)</i>	Southern Freetail Bat	Protected
	<i>Nyctophilus sp.</i>	Long Eared Bat	Protected
	<i>Scotorepens balstoni</i>	Inland Broadnosed Bat	Protected
	<i>Vespadelus sp.</i>	Forest Bat	Protected
	<i>Vespadelus vuturnus</i>	Little Forest Bat	Protected

Type	Scientific name	Common name	Status
Reptile			
	<i>Carlia tetradactyla</i>	Southern Rainbow Skink	Protected
	<i>Christinus marmoratus</i>	Southern Marbled Gecko	Protected
	<i>Cryptoblepharus carnabyi</i>	Carnaby's Wall Skink	Protected
	<i>Ctenotus robustus</i>	Large Striped Skink	Protected
	<i>Diplodactylus vittatus</i>	Eastern Stone Gecko	Protected
	<i>Egernia striolata</i>	Tree Crevice Skink	Protected
	<i>Morethia boulengeri</i>	Boulenger's Skink	Protected
	<i>Varanus varius</i>	Tree Goanna/Lace Monitor	Protected

Appendix 2: Flora list

Type	Scientific name	Common name	Zone
Upper-storey			
	<i>Brachychiton populneus</i>	Kurrajong	2
	<i>Eucalyptus albens</i>	White Box (below 360m AHD contour)	1
	<i>Eucalyptus blakelyi</i>	Red Gum (below 360m AHD contour)	1
	<i>Eucalyptus dealbata</i>	Tumbledown Red Gum (above 360m AHD contour)	2
	<i>Eucalyptus macrorhyncha</i>	Red Stringybark (in gully area)	3
	<i>Eucalyptus nortonii</i>	Bundy (in gully area)	3
	<i>Eucalyptus polyanthemos</i>	Red Box	1
Mid-storey			
	<i>Acacia doratoxylon</i>	Currawang	2
	<i>Acacia rubida</i>	Red-stem Wattle	2
	<i>Allocasuarina verticillata</i>	Drooping Sheoak	2
	<i>Leptospermum continentale</i>	Prickly Tea Tree (in gully area)	3
Under-storey			
	<i>Stypandra glauca</i>	Nodding Blue Lily	2
Ground cover			
	<i>Aristida behriana</i>	Brush Wire Grass	2
	<i>Aristida ramosa</i>	Purple Wire Grass	2
	<i>Austrodanthonia caespitosa</i>	Wallaby Grass	1 & 2
	<i>Austrostipa densiflora</i>	Brushtail Spear Grass	2
	<i>Austrostipa scabra</i>	Rough Spear Grass	2
	<i>Bothriochloa macra</i>	Red leg grass	2
	<i>Chenopodium pumilio</i>	Scented Crumbweed	2
	<i>Cymbopogon refractus</i>	Barbed-wire Grass	2
	<i>Dianella longifolia</i>	Plains Flaxlily	2
	<i>Dichopogon strictum</i>	Chocolate Lily	2
	<i>Elymus scaber</i>	Wheat Grass	2
	<i>Geranium solanderi</i>	Native Geranium	2
	<i>Glycine tabacina</i>	Variable Glycine	2
	<i>Gonocarpus tetragynus</i>	Raspwort	1 & 2
	<i>Hardenbergia violacea</i>	Sarsparilla	2
	<i>Isotoma axillaris</i>	Rock Isotome	2
	<i>Lomandra filiformis</i>	Wattle Matrush	1 & 2
	<i>Microlaena stipoides</i>	Weeping Grass	1 & 2
	<i>Oxalis perennans</i>	Wood Sorrel	1 & 2
	<i>Pelargonium australe</i>	Native Pelargonium	2
	<i>Rumex brownii</i>	Native Dock	2
	<i>Senecio quadridentatus</i>	Fireweed	2 & 3
	<i>Tricoryne elatior</i>	Yellow Rush Lily	2 & 3
	<i>Vittadinia sp.</i>	Fuzz weed	2
Ferns & succulents			
	<i>Asplenium flabellifolium</i>	Necklace Fern	2
	<i>Cheilanthes austrotenuifolia</i>	Common Rockfern	2
	<i>Cheilanthes sieberi</i>	Rock Fern	2
	<i>Cladia sullivanii</i>	White Lichen	2 & 3
	<i>Pleurosorus rutifolius</i>	Blanket Fern	2
Exotic			
	<i>Arctotheca calendula</i>	Capeweed	1, 2 & 3
	<i>Briza maxima</i>	Blowfly Grass	1 & 2
	<i>Bromus diandrus</i>	Great Brome	2
	<i>Bromus hordeaceus</i>	Soft Brome	1, 2 & 3
	<i>Bromus sterilis</i>	Sterile Brome	1 & 2
	<i>Celtis australis</i>	Nettle Tree	2

Type	Scientific name	Common name	Zone
	<i>Centaurea calcitrapa</i>	Star Thistle	2
	<i>Centurium erythracea</i>	Common Centaury	2
	<i>Cichorium intybus</i>	Chickory	2
	<i>Cirsium vulgare</i>	Spear Thistle	1 & 2
	<i>Echium plantagineum</i>	Paterson's Curse (Class 4, Locally Controlled Weed)	1, 2 & 3
	<i>Erodium cicutarium</i>	Crowsfoot	2
	<i>Heliotropium europaeum</i>	Common heliotrope	2
	<i>Hordeum sp</i>	Barley Grass	1 & 2
	<i>Hypericum perforatum</i>	St Johns Wort	2
	<i>Hypochoeris glabra</i>	Catears	1, 2 & 3
	<i>Hypochoeris radicata</i>	Flatweed	1, 2 & 3
	<i>Lolium perenne</i>	Rye grass	1
	<i>Marrubium vulgare</i> *	Horehound (Class 4, Locally Controlled Weed)	1 & 2
	<i>Onopordum acanthium</i> *	Scotch Thistle (Class 4, Locally Controlled Weed)	1 & 2
	<i>Paspalum dilatatum</i>	Paspalum	1
	<i>Romulea rosea</i> *	Onion Grass (Class 5, Restricted Plant)	1, 2 & 3
	<i>Rosa rubiginosa</i> *	Briar Rose (Class 4, Locally Controlled Weed)	1 & 2
	<i>Rumex acetosella</i>	Sheep Sorrel	1, 2 & 3
	<i>Solanum sp.</i>	Nightshade	1 & 2
	<i>Taraxium officinale</i>	Dandelion	1 & 2
	<i>Vulpia bromoides</i>	Squirrel Tail Fescue	1, 2 & 3

Key: *Noxious weed Declarations for Greater Hume Shire Council

The characteristics of each class of noxious weed listed above are as follows:

- "Class 4": noxious weeds are plants that pose a threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.
- "Class 5": noxious weeds are plants that are likely, by their sale or the sale of their seeds or movement within the State or an area of the State, to spread in the State or outside the State.

A weed that is classified as a Class "1", "2" or "5" noxious weed is referred to in the *Noxious Weeds Act 1993* (NW Act) as a "notifiable weed". Section 15 of the NW Act states that occupiers of the land must notify the local control authority of notifiable weeds. An occupier of land (other than a local control authority) on which there is a notifiable weed must notify the local control authority for the land of that fact within 3 days of becoming aware that the notifiable weed is on the land.

A weed declared as noxious under "Class 4" must be controlled by one or more of the following prescribed methods:

- The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.
- The plant must not be sold, propagated or knowingly distributed.

Appendix 3: Specialist reptile report

Expansion of Lubke Quarry – Reptile Survey
By Damian Michael, BSc BAppSc (Hons)
December 2006

Methodology

Reptiles were surveyed by actively searching all available habitats over the study area including beneath rocks, logs, bark and leaf litter as well as inspecting the crevices of rocks and stumps using a hand held torch. The survey was conducted on the 9th December 2006 between the hours of 0900 and 1300 at a temperature range of 28 - 33°C. Wind was a moderate north-westerly, cloud cover was zero and humidity was low.

Geology

The outcrops comprised various granite formations dominated by a fine grained plagioclase granodiorite which intergrades with quartz porphyry. These granites were formed 500 – 370 million years ago during the Devonian period and form a small isolated intrusion west of the massive pluton associated with the Great Dividing Range orogeny. The rock formation is classified as a 'nubbin', characterised by the highly eroded bedrock which has faulted along vertical and horizontal planes to form a jumble of highly weathered rocks. Base granites appear to be overlain with a sedimentary claystone along the eastern outwash slope.

Geological features present include a few large boulders, rock shelves, domes and surface expanses. A large amount of loose surface rock is present although large tors and coppice castles (fractured tors) are absent. Microhabitat features present include numerous small crevices, larger fissures, exfoliated basal and vertical flakes and horizontal surface slabs. The majority of faulting is vertical facilitating the rapid breakdown of boulders into detached smaller rocks.

Reptile Composition

Twelve individual reptiles were recorded during the survey encompassing seven species from the families Scincidae and Gekkonidae (Table 1). All species are considered secure throughout the south west slopes although three species (Eastern Stone Gecko, Carnaby's Wall Skink and Tree Crevice Skink) reach their highest densities on rock outcrops in the region, particularly granite formations.

No threatened species were recorded or were expected to occur based on the lack of suitable habitat. That is:

(1) the absence of appropriate rock (granitorised rhyodacite), Kangaroo grass and associated ants made it unlikely that the Pink-tailed Worm Lizard was present. Based on the survey there is no evidence to suggest they occur on the outcrop itself, no specimens or slough skins were found under approximately 100 rocks turned on a 4ha grid covering the entire outcrop (Pink-tail Worm Lizards often leave sloughed skins under well used rocks). As yet Pink-tail Worm Lizards in the South West Slopes have not been recorded from rock outcrops per se, or in areas with substantial amounts of exposed bedrock, as in the case with this quarry, but rather in areas with scattered emergent rock. The majority of rocks on the site were either deeply embedded or were part of the emergent bedrock, i.e. not suitable. Substantial amounts of scattered surface rocks necessary for Pink-tailed Worm Lizards were absent from the site therefore reducing the likelihood of these being present on the outcrop itself;

(2) Striped Legless Lizards prefer lowland native or secondary grasslands. The quarry site is a rocky outcrop with partial cover of native grasses, therefore does not constitute suitable habitat. Striped Legless Lizards are often associated with high densities of invertebrate tunnels (Michael et al 2003, *Terrestrial Vertebrate Fauna of Grasslands and Grassy Woodlands in Terrick Terrick National Park, Northern Victoria*, Victorian Naturalist 120 (5) 164-171). Invertebrate tunnels were absent from the lower grassy sections of the site reducing the site's potential as habitat. There are no recent authenticated records for this species within 100m of the site. (The recent Tarcutta recorded specimen was not positively identified in the hand or keyed out using appropriate guides, and no photo or specimen was lodged with the museum. Therefore that record is viewed as a tentative rather than a positive recording.);

(3) bioclimatic conditions were outside those preferred by the Little Whip Snake; and

(4) the lack of termitaria, hollow logs and the size of the remnant made it unlikely Rosenberg's Goanna was present.

Table 1. List of reptiles recorded from Morgan's Ridge study area.

Species	Common Name	Abundance
<i>Christinus marmoratus</i>	Southern Marbled Gecko	1
<i>Diplodactylus vittatus</i>	Eastern Stone Gecko	1
<i>Carlia tetradactyla</i>	Southern Rainbow Skink	3
<i>Cryptoblepharus carnabyi</i>	Carnaby's Wall Skink	4
<i>Ctenotus robustus</i>	Large Striped Skink	1
<i>Egernia striolata</i>	Tree Crevice Skink	1
<i>Morethia boulengeri</i>	Boulenger's Skink	1
Total		12

Potential species on site

Based on habitat suitability and distance to larger remnants, other species that are likely to be present include the Olive Legless Lizard, Eastern Bearded Dragon, Lace Monitor, Dwyer's Snake, Woodland Blindsnake, Eastern Brown Snake and Red-bellied Black Snake.

Specific Habitat Preferences within the South West Slopes

Southern Marbled Gecko

The Southern Marbled Gecko is arboreal and saxicolous (rock dwelling) and is common and widespread in old growth remnants particularly beneath the bark of large *Eucalyptus* trees such as Apple Box, Yellow Box and Red Gum, or any mature tree with thick exfoliating bark. It is also common on granite outcrops where it shelters beneath rock exfoliations and flakes, emerging at night to forage on the rock surface. It was only recorded beneath the bark of a Tumbledown Gum during this survey although it is likely to inhabit any trees with shedding bark in the study area.

Eastern Stone Gecko

The Eastern Stone Gecko is terrestrial and locally uncommon being only known from rocky remnants. It utilises rocks, debris and fallen timber in rocky areas particularly where surface rock overlies expanses of bedrock. Often numerous skins are found beneath particular rocks suggesting high site fidelity and a degree of social aggregation. Only an aggregate of slough skins were found beneath a cluster of rocks during the survey although this species is likely to occur on any exposed bedrock where surface rock is abundant.

Southern Rainbow Skink

The Southern Rainbow Skink is terrestrial and is common and widespread in open grassy woodland remnants and grasslands. It utilises leaf litter, fallen branches and timber as well as surface rocks but reaches its highest densities on the lower slopes and valleys. The presence of two gravid (pregnant) individuals suggests ovi-deposition may be common in rocky outcrops.

Carnaby's Wall Skink

Carnaby's Wall Skink is arboreal and saxicolous (rock dwelling) and is locally common in coppiced regrowth woodland where it favours standing dead trees and fallen timber. It is also common on granite outcrops where it shelters beneath rock exfoliations, flakes and small crevices. It is likely to be the most common saxicolous skink in the study area favouring dead trees, rock faces and fallen timber.

Large Striped Skink

The Large Striped Skink is terrestrial and is common and widespread in woodlands and grasslands. It utilises leaf litter, fallen branches and timber as well as surface rocks but reaches its highest densities in areas with high amounts of scattered surface rock. It constructs permanent burrow systems beneath surface rocks which correlate with its abundance. Although few individuals were recorded, numerous burrow systems were evident suggesting it is the most common terrestrial skink in the study area.

Tree Crevice Skink

The Tree Crevice Skink is arboreal and saxicolous (rock dwelling) and is locally common in woodlands where it shelters beneath the bark of trees with large exfoliated bark such as Red Gums or within the split bark of box trees. It reaches its highest density on granite outcrops where it shelters within tight fitting crevices. This species exhibits a level of sociality which varies with the quality of its habitat, such that on high quality outcrops (those with massive tors and numerous cracks) densities of 30 individuals per hectare are common with evidence of discrete family groupings. Only a single sub-adult was recorded suggesting that the absence of significant social structure in the study area corresponds with low quality of habitat for this species.

Boulenger's Skink

Boulenger's Skink is terrestrial and is common and widespread in woodland and grassland. It utilises leaf litter, fallen branches and timber as well as surface rocks but reaches its highest densities in lowland areas with high amounts of fallen timber. It is one of the most common terrestrial species on the lower slopes and valleys and only occurs in low densities on granite outcrops.

Recommendations

- **Create a corridor:** Rocks unearthed during the extraction process and not used for quarry purposes could be distributed between Morgan's Ridge and the study area outcrop in order to facilitate dispersal behaviour of juvenile and subadult lizards.
- **Avoid dense plantings:** In regards to revegetation avoid dense plantings on or near outcrops as significant canopy cover can create shade levels too high for long-term reptile occupation.
- **Revegetate understorey:** Typical shrubs which are present on granite outcrops in the region include: *Stypandra glauca*, *Dodonea viscosa*, Tick Indigo, Austral Indigo, *Pultenea platyphylla* and *Corea reflexa*.
- **Reduce grazing pressure:** Minimise damage to the outcrop and associated vegetation. This can be achieved by restricting stock access completely or using the crash graze

method during appropriate months to manage exotics and promote native grasses and forbs.

- **Control foxes:** It is recommended that a co-ordinated fox control program be implemented with adjoining landowners.
- **Retain hollow bearing and large mature trees:** The potential impact on the three arboreal species (Marbled Gecko, Carnaby's Wall Skink and Tree Crevice Skink) can be minimised by retaining as many large trees as possible on site.
- **Retain fallen timber and hollow logs:** The potential impact on terrestrial and arboreal species (Carnaby's Wall Skink, Boulenger's Skink, Large Striped Skink and Rainbow Skink) can be minimised by retaining as much fallen timber on site as possible.
- **Retain surface rock overlying exposed bedrock:** The potential impact on the Stone Gecko and Large Striped Skink can be minimised by retaining as much rock on rock as possible on site.

Reptile abundance

Species	Age	Sex	Microhabitat	Activity	Topo position	Dist_ edge (m)	% rock	% grass	% forb	% litter	% soil	# tree	# dead	# shrub	# log	# crevice	% shade
<i>Ctenotus robustus</i>	Sub Adult	NA	Under rock	In refuge	slope	10	65	10	2	20	5	0	0	0	0	0	0
<i>Diplodactylus vittatus</i>	Slough skin	NA	Under rock	NA	Mid	10	65	10	2	20	5	0	0	0	0	0	0
<i>Carlia tetradactyla</i>	Gravid Adult	Female	On rock	Basking	slope	30	50	30	5	10	0	0	0	0	0	1	0
<i>Christinus marmoratus</i>	Sub Adult	Male	Under bark	In refuge	Peak	60	10	10	2	15	55	2	0	0	2	0	5
<i>Morethia boulengeri</i>	Adult	Female	Under rock	In refuge	Peak	60	70	0	5	10	10	0	0	0	0	1	0
<i>Egernia striolata</i>	Sub Adult	NA	In crevice	In refuge	Upper	30	60	10	5	10	5	0	0	0	0	1	0
<i>Carlia tetradactyla</i>	Adult	Female	In crevice	Basking	Upper	20	35	55	0	10	0	0	0	0	0	1	0
<i>Carlia tetradactyla</i>	Adult	Male	Under rock	In refuge	Upper	20	35	55	0	10	0	0	0	0	0	0	0
<i>Cryptoblepharus carnabyi</i>	Adult	NA	On rock shelf	In refuge	Upper	60	45	15	0	35	0	2	0	0	4	1	5
<i>Cryptoblepharus carnabyi</i>	Sub Adult	NA	On rock	In refuge	Upper	60	45	15	0	35	0	0	0	0	0	0	0
<i>Cryptoblepharus carnabyi</i>	Adult	NA	On rock face	Basking	Mid	50	100	5	0	5	0	1	0	0	0	1	5
<i>Cryptoblepharus carnabyi</i>	Adult	NA	On rock face	Basking	slope	40	75	5	2	25	5	4	0	0	12	3	5

Appendix 4: Specialist Bat Report

Glenda Datson

Report for
Environmental Impact Statement:
Expansion of Lubke Quarry
'Cromer', Hume Highway, Holbrook
Anabat survey and analysis

January 2007



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Appendices

- A Microchiropteran bat species from the region



1. Introduction

GHD was engaged by Glenda Datson, Environmental and Horticultural Consultant to undertake Anabat analysis for a proposed quarry expansion site of approximately 12.5 hectares, 5 km north of Holbrook.

The following tasks were undertaken:

- ▶ Anabat analysis and summary of findings;
- ▶ Summary of the methods used and references cited; and
- ▶ Listing of bat species protected, threatened or listed under New South Wales or Commonwealth legislation, which are known from or likely to occur within the region of the subject site.

The information provided in this report is required for inclusion into an Assessment of Significance of the impacts upon flora and fauna of the proposed development. The Assessment of Significance is to be undertaken by Glenda Datson.



2. Methods

The echolocation calls of insectivorous bats were recorded at two locations within the subject site using ultrasonic detectors (Anabat II Bat Detectors) coupled with Compact Flash Zero Crossing Analysis Interface Modules (CF ZCAIMS; Titley Electronics, Ballina NSW) and stored on compact flash (CF) memory cards for later computer analysis. Prior to field placement each detector was calibrated and set to operate at the same sensitivity level (7, the maximum is 10). Detectors were orientated at a 45 ° angle on the ground.

Calls collected during the field survey were identified using zero-crossing analysis and Analook software by visually comparing call traits with reference calls. Reference calls were sourced from previous surveys conducted in the region by C. Grabham. No reference calls were collected during the survey. The *Bat calls of NSW: Region based guide to the echolocation calls of microchiropteran bats* (2004) was used as a guide to call analysis. Due to the lack of local reference calls, high level of intra-specific variability and inter-specific overlap in call characteristics, a conservative approach was taken when analysing calls.

A call was defined as a sequence of three or more consecutive pulses of similar frequency. Pulses separated from another sequence by a period of five seconds were considered to be separate calls. Scattered sequences, where intermittent pulses were not separated by more than five seconds, were recognised as a single pass. Where constant activity was recorded, a single pass was defined as 15 seconds (i.e. one full display screen comprising as Anabat sequence file). Although this method underestimates the number of bat passes when there is continuous activity, the standard unit of time remains consistent (Law *et al.* 1998; Law *et al.* 1999). Due to variability in the quality of calls and the difficulty in distinguishing some species each call was assigned a confidence rating (see Mills *et al.* 1996 & Duffy *et al.* 2000) as summarised in Table 2.

Nomenclature for bats will follow that of Churchill (1998) with the exception of *Tadarida australis* which has been used instead of *Nyctinomus australis* after Reardon (1999).



3. Results

Approximately 24.5 hours of survey was undertaken using two Anabat detectors for two nights within the subject site.

Analysis revealed the presence of eight species within the subject site. The threatened *Miniopterus schreibersii oceansis* was tentatively identified as a result of Anabat analysis, however the quality of the call and overlap with *Vespadelus* species prevented a positive identification. Given that this species has been recorded previously within the locality (Herring 2002) it is considered likely that this species would occur within the subject site.

Table 1 Anabat analysis results.

✓ = species group was recorded for that site. - = not recorded. Total number of species recorded for each site is based on probable and definite identification only.

Site and date	Card 1 – Area 2 9-10/12/06	Card 1 – Area 2 10-11/12/06	Card 2- Area 1 9-10/12/06
Species or group	approx 8 hrs, start 20:30 end 04:40	approx 8.5 hrs, start 20:30 end 05:00	approx 8 hrs, start 21:15 end 05:16
<i>T. australis</i>	D	D	D
<i>S. flaviventris</i> (TS)	-	-	-
<i>M. planiceps</i> (lpf)	D	D	D
<i>C. gouldii</i>	D	-	D
<i>M. planiceps</i> (spf)	-	-	-
<i>C. gouldii</i> / <i>M. planiceps</i> (lpf)	✓	✓	✓
<i>C. gouldii</i> / <i>M. planiceps</i> (spf)	-	-	-
<i>S. balstoni</i>	PR	PO	PO
<i>S. balstoni</i> / <i>C. gouldii</i>	✓	✓	✓
<i>M. schreibersii</i>	PO	-	-
<i>V. vulturnus</i>	D	D	-
<i>V. darlingtoni</i>	PR	PO	-
<i>V. regulus</i>	-	PR	-
<i>Vespadelus</i> sp.	✓	✓	✓
<i>M. schreibersii</i> / <i>Vespadelus</i> sp.	✓	-	-
<i>C. morio</i>	D	PR	D



Site and date	Card 1 – Area 2 9-10/12/06	Card 1 – Area 2 10-11/12/06	Card 2- Area 1 9-10/12/06
Species or group	approx 8 hrs, start 20:30 end 04:40	approx 8.5 hrs, start 20:30 end 05:00	approx 8 hrs, start 21:15 end 05:16
<i>V.vulturnus/C.morio</i>	✓	-	-
<i>M. macropus</i>	-	-	-
<i>Scotorepens sp.</i>	-	-	-
<i>Nyctophilus sp.</i>	✓	✓	✓
Total no. species recorded each site	7	5	4

Table 2 Confidence ratings applied to calls

Identification	Description
D - Definite	Species identification not in doubt.
PR - Probable	Call most likely to represent a particular species. There exists a low probability of confusion with species of similar call types.
PO - Possible	Call characteristics are comparable with the species, but there exists a reasonable probability of confusion with one or more similar species or quality or length of call prohibits a confident identification.
Species Group	<p>Call made by one of two or more species. Call characteristics overlap making it to difficult to distinguish between species.</p> <p><i>C. gouldii/M. planiceps (lpf)</i></p> <p><i>C. gouldii/M. planiceps (spf)</i></p> <p><i>C. gouldii/S. balstoni.</i></p> <p><i>C. morio/V. vulturnus</i></p> <p><i>Nyctophilus sp.</i> The calls of <i>Nyctophilus geoffroyi</i> and <i>N. gouldi</i> cannot be distinguished during the analysis process and are therefore lumped together.</p>



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Appendix A - Microchiropteran bat species from the region

The conservation status of microchiropteran bat species known to or likely to occur occur within the region after Duncan A. et al. 1999, NSW Threatened Species Conservation Act 1995 and the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999. Species distribution follows that of Churchill 1998 and Strahan 1995. APAB: Action Plan for Australian Bats.

Scientific name	Common name	Conservation Status		
		APAB	National	NSW
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	LR (lc)	-	-
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	LR (lc)	-	-
<i>Chalinolobus picatus</i>	Little Pied Bat	-	-	Vulnerable (Schedule 2)
<i>Miniopterus schreibersii oceanensis</i>		LR (lc)	Vulnerable	Vulnerable (Schedule 2)
<i>Myotis macropus</i>	Southern Myotis	LR (nr)		Vulnerable (Schedule 2)
<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat	LR (lc)	-	-
<i>Vespadelus darlingtoni</i>	Large Forest Bat	LR (lc)	-	-
<i>Vespadelus vulturnus</i>	Little Forest Bat	LR (lc)	-	-
<i>Vespadelus regulus</i>	Southern Forest Bat	LR (lc)	-	-
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	LR (lc)	-	-
<i>Nyctophilus gouldi</i>	Gould's Long-eared Bat	LR (lc)	-	-
<i>Nyctophilus timoriensis</i> (south-eastern form)	Greater Long-eared Bat	VU	Vulnerable	Vulnerable (Schedule 2)
<i>Mormopterus planiceps</i> (short penis form) species 2*	Eastern Free-tail Bat	LR (lc)	-	-
<i>Mormopterus planiceps</i> (long penis form) species 4*	Southern Free-tail Bat	LR (lc)	-	-
<i>Tadarida australis</i>	White-striped Mastiff Bat	LR (lc)	-	-
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat	LR (lc)	-	Vulnerable (Shedule2)



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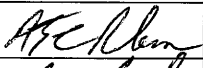
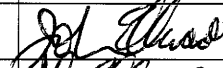


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		Name	Signature	Name	Signature	Date
0	C Grabham	A Buchan		John Ellwood		4/1/07
1	C Grabham	A Buchan		John Ellwood		31/1/07

Appendix 5: NSW DECC – Threatened Flora and Fauna List

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Upper Slopes CMA sub-region

Below is a list of the 54 threatened species found in the Upper Slopes sub-region. You can also see a list of:

- [threatened algae](#)
- [threatened animals](#)
- [threatened communities](#)
- [threatened fungi](#)
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Threatened species known or predicted to occur in the Upper Slopes CMA sub-region

Scientific Name	Common Name	Type of species	Level of Threat	Known or Predicted to occur
Acacia phasmoides	Phantom Wattle	Plant > Shrubs	Vulnerable	Known
Amphibromus fluitans	River Swamp Wallaby-grass	Plant > Herbs and Forbs	Vulnerable	Known
Aprasia parapulchella	Pink-tailed Worm-lizard	Animal > Reptiles	Vulnerable	Known
Aquatic ecological community in the natural drainage system of the lower Murray River catchment	Aquatic ecological community in the natural drainage system of the lower Murray River catchment	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
Bidyanus bidyanus	Silver perch	Animal > Fish	Vulnerable	Known
Botaurus poeciloptilus	Australasian Bittern	Animal > Birds	Vulnerable	Known
Burhinus grallarius	Bush Stone-curlew	Animal > Birds	Endangered	Known
Caladenia concolor	Crimson Spider Orchid	Plant > Orchids	Endangered	Known
Caladenia rosella	Rosella Spider Orchid	Plant > Orchids	Presumed extinct	Known
Callocephalon fimbriatum	Gang-gang Cockatoo	Animal > Birds	Vulnerable	Known
Calyptorhynchus lathamii	Glossy Black-cockatoo	Animal > Birds	Vulnerable	Known
Cercartetus nanus	Eastern Pygmy-possum	Animal > Marsupials	Vulnerable	Known
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Animal > Birds	Vulnerable	Known
Dasyurus maculatus	Spotted-tailed Quoll Striped Legless	Animal > Marsupials	Vulnerable	Known

Delma impar	Lizard	Animal > Reptiles	Vulnerable	Predicted
Falco hypoleucos	Grey Falcon	Animal > Birds	Vulnerable	Known
Falsistrellus tasmaniensis	Eastern False Pipistrelle	Animal > Bats	Vulnerable	Known
Grantiella picta	Painted Honeyeater	Animal > Birds	Vulnerable	Known
Grus rubicunda	Brolga	Animal > Birds	Vulnerable	Known
Lathamus discolor	Swift Parrot	Animal > Birds	Endangered	Known
Litoria booroolongensis	Booroolong Frog	Animal > Amphibians	Endangered	Known
Litoria raniformis	Southern Bell Frog	Animal > Amphibians	Endangered	Known
Lophoictinia isura	Square-tailed Kite	Animal > Birds	Vulnerable	Known
Maccullochella macquariensis	Trout cod	Animal > Fish	Endangered	Known
Macquaria australasica	Macquarie perch	Animal > Fish	Vulnerable	Known
Macquaria australasica	Macquarie perch	Animal > Fish	Vulnerable	Known
Macquaria australasica	Macquarie perch	Animal > Fish	Vulnerable	Known
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Animal > Birds	Vulnerable	Known
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Animal > Birds	Vulnerable	Known
Myotis adversus	Large-footed Myotis	Animal > Bats	Vulnerable	Predicted
Nannoperca australis	Southern pygmy perch	Animal > Fish	Vulnerable	Known
Neophema pulchella	Turquoise Parrot	Animal > Birds	Vulnerable	Known
Ninox connivens	Barking Owl	Animal > Birds	Vulnerable	Known
Ninox strenua	Powerful Owl	Animal > Birds	Vulnerable	Known
Oxyura australis	Blue-billed Duck	Animal > Birds	Vulnerable	Known
Pachycephala olivacea	Olive Whistler	Animal > Birds	Vulnerable	Known
Petaurus norfolcensis	Squirrel Glider	Animal > Marsupials	Vulnerable	Known
Petroica rodinogaster	Pink Robin	Animal > Birds	Vulnerable	Predicted
Phascogale tapoatafa	Brush-tailed Phascogale	Animal > Marsupials	Vulnerable	Predicted
Phascolarctos cinereus	Koala	Animal > Marsupials	Vulnerable	Known
Pilularia novae-hollandiae	Austral Pillwort	Plant > Ferns and Cycads	Endangered	Known
Polytelis swainsonii	Superb Parrot	Animal > Birds	Vulnerable	Predicted
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Animal > Birds	Vulnerable	Known
Pyrrholaemus sagittatus	Speckled Warbler	Animal > Birds	Vulnerable	Known

Rostratula benghalensis	Painted Snipe	Animal > Birds	Endangered	Known
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Animal > Bats	Vulnerable	Known
Senecio garlandii	Woolly Ragwort	Plant > Herbs and Forbs	Vulnerable	Known
Stagonopleura guttata	Diamond Firetail	Animal > Birds	Vulnerable	Known
Stictonetta naevosa	Freckled Duck	Animal > Birds	Vulnerable	Known
Swainsona sericea	Silky Swainson-pea	Plant > Herbs and Forbs	Vulnerable	Predicted
Tyto novaehollandiae	Masked Owl	Animal > Birds	Vulnerable	Known
Varanus rosenbergi	Rosenberg's Goanna	Animal > Reptiles	Vulnerable	Known
White Box Yellow Box Blakely's Red Gum Woodland	Box-Gum Woodland	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
Xanthomyza phrygia	Regent Honeyeater	Animal > Birds	Endangered	Known

Appendix 6: Commonwealth Protected Matters Map Search and Report



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Protected Matters Search Tool

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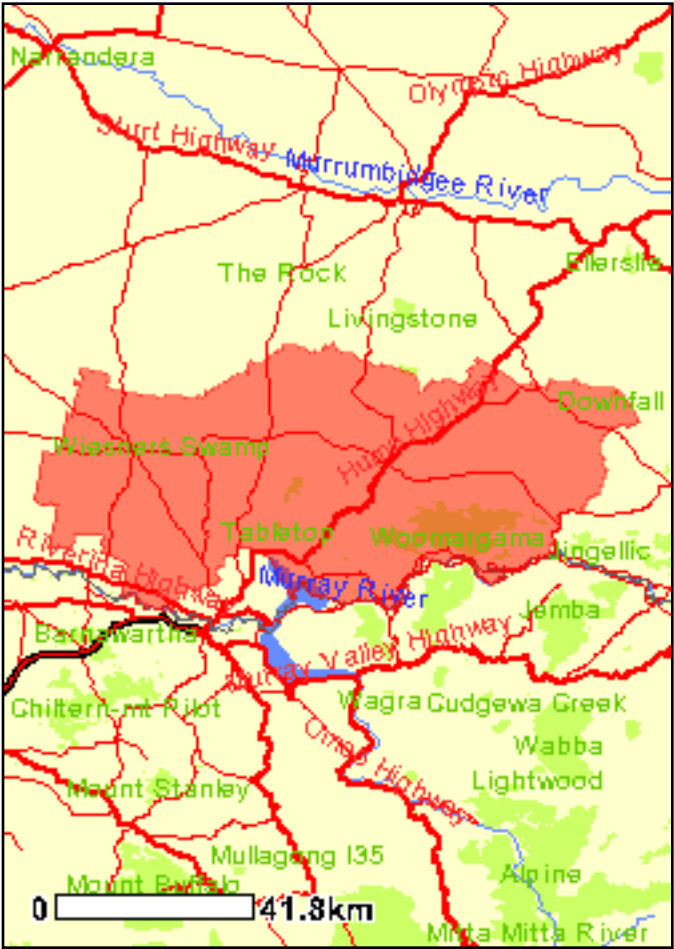
EPBC Act Protected Matters Report

24 November 2006 10:20

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the [caveat](#) at the end of the report.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at <http://www.environment.gov.au/atlas> may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.deh.gov.au/epbc/assessmentsapprovals/index.html>



Search Region: Greater Hume, NSW



Report Contents:

- [Summary](#)
- [Details](#)
- [Matters of NES](#)
 - [Other matters protected by the EPBC Act](#)
 - [Extra Information](#)
- [Caveat](#)
- [Acknowledgments](#)

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see <http://www.deh.gov.au/epbc/assessmentsapprovals/guidelines/index.html>.

World Heritage Properties:	None
National Heritage Places:	None
<u>Wetlands of International Significance:</u> (Ramsar Sites)	4
Commonwealth Marine Areas:	None
<u>Threatened Ecological Communities:</u>	2
<u>Threatened Species:</u>	24
<u>Migratory Species:</u>	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at <http://www.deh.gov.au/heritage/index.html>.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at <http://www.deh.gov.au/epbc/permits/index.html>.

Commonwealth Lands:	4
Commonwealth Heritage Places:	None
Places on the RNE:	4
Listed Marine Species:	11
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	8
Other Commonwealth Reserves:	None
Regional Forest Agreements:	2

Details

Matters of National Environmental Significance

Wetlands of International Significance [Dataset Information] (Ramsar Sites)		
BARMAH FOREST	Within same catchment as Ramsar site	
FIVEBOUGH AND TUCKERBIL SWAMPS	Within same catchment as Ramsar site	
GUNBOWER FOREST	Within same catchment as Ramsar site	
NSW CENTRAL MURRAY STATE FORESTS	Within same catchment as Ramsar site	
Threatened Ecological Communities [Dataset Information]	Status	Type of Presence

Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Threatened Species [Dataset Information]	Status	Type of Presence
--	--------	------------------

Birds

Lathamus discolor * Swift Parrot	Endangered	Species or species habitat may occur within area
Polytelis swainsonii * Superb Parrot	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis * Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Xanthomyza phrygia * Regent Honeyeater	Endangered	Species or species habitat likely to occur within area

Frogs

Litoria raniformis * Southern Bell Frog, Growling Grass Frog, Warty Bell Frog, Green and Golden Frog	Vulnerable	Species or species habitat may occur within area
---	------------	--

Insects

Synemon plana * Golden Sun Moth	Critically Endangered	Species or species habitat may occur within area
--	-----------------------	--

Mammals

Dasyurus maculatus maculatus (SE mainland population) * Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	Endangered	Species or species habitat may occur within area
Nyctophilus timoriensis (South-eastern form) * Eastern Long-eared Bat	Vulnerable	Species or species habitat may occur within area
Pseudomys fumeus * Konoom, Smoky Mouse	Endangered	Species or species habitat may occur within area

Ray-finned fishes

<u><i>Maccullochella macquariensis</i></u> *	Endangered	Species or species habitat may occur within area
Trout Cod		
<u><i>Maccullochella peelii peelii</i></u> *	Vulnerable	Species or species habitat may occur within area
Murray Cod, Cod, Goodoo		
<u><i>Macquaria australasica</i></u> *	Endangered	Species or species habitat may occur within area
Macquarie Perch		

Reptiles

<u><i>Aprasia parapulchella</i></u> *	Vulnerable	Species or species habitat likely to occur within area
Pink-tailed Worm-lizard		
<u><i>Delma impar</i></u> *	Vulnerable	Species or species habitat likely to occur within area
Striped Legless Lizard		

Plants

<u><i>Acacia phasmoides</i></u> *	Vulnerable	Species or species habitat likely to occur within area
Phantom Wattle		
<u><i>Ammobium craspedioides</i></u> *	Vulnerable	Species or species habitat likely to occur within area
Yass Daisy		
<u><i>Amphibromus fluitans</i></u> *	Vulnerable	Species or species habitat may occur within area
River Swamp Wallaby-grass		
<u><i>Brachyscome muelleroides</i></u> *	Vulnerable	Species or species habitat likely to occur within area
Mueller Daisy		
<u><i>Caladenia concolor</i></u> *	Vulnerable	Species or species habitat likely to occur within area
Crimson Spider-orchid, Maroon Spider-orchid		
<u><i>Diuris sheaffiana</i></u> *	Vulnerable	Species or species habitat may occur within area
Tricolour Diuris		
<u><i>Goodenia macbarronii</i></u> *	Vulnerable	Species or species habitat likely to occur within area
Narrow Goodenia		
<u><i>Senecio garlandii</i></u> *	Vulnerable	Species or species habitat likely to occur within area
<u><i>Swainsona murrayana</i></u> *	Vulnerable	Species or species habitat likely to occur within area
Slender Darling-pea, Slender Swainson, Murray Swainson-pea		
<u><i>Thesium australe</i></u> *	Vulnerable	Species or species habitat likely to occur within area
Austral Toadflax, Toadflax		

Migratory Species [[Dataset Information](#)]

Status

Type of Presence

Migratory Terrestrial Species**Birds**[*Haliaeetus leucogaster*](#)

White-bellied Sea-Eagle

Migratory

Species or species habitat likely to occur within area

[*Hirundapus caudacutus*](#)

White-throated Needletail

Migratory

Species or species habitat may occur within area

[*Myiagra cyanoleuca*](#)

Satin Flycatcher

Migratory

Breeding likely to occur within area

[*Rhipidura rufifrons*](#)

Rufous Fantail

Migratory

Breeding may occur within area

[*Xanthomyza phrygia*](#)

Regent Honeyeater

Migratory

Species or species habitat likely to occur within area

Migratory Wetland Species**Birds**[*Gallinago hardwickii*](#)

Latham's Snipe, Japanese Snipe

Migratory

Species or species habitat may occur within area

[*Rostratula benghalensis s. lat.*](#)

Painted Snipe

Migratory

Species or species habitat may occur within area

Other Matters Protected by the EPBC ActListed Marine Species [[Dataset Information](#)]

Status

Type of Presence

Birds[*Apus pacificus*](#)

Fork-tailed Swift

Listed -
overfly
marine
area

Species or species habitat may occur within area

[*Ardea alba*](#)

Great Egret, White Egret

Listed -
overfly
marine
area

Species or species habitat may occur within area

<i>Ardea ibis</i> Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
<i>Gallinago hardwickii</i> Latham's Snipe, Japanese Snipe	Listed - overfly marine area	Species or species habitat may occur within area
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
<i>Hirundapus caudacutus</i> White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area
<i>Lathamus discolor</i> Swift Parrot	Listed - overfly marine area	Species or species habitat may occur within area
<i>Merops ornatus</i> Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
<i>Myiagra cyanoleuca</i> Satin Flycatcher	Listed - overfly marine area	Breeding likely to occur within area
<i>Rhipidura rufifrons</i> Rufous Fantail	Listed - overfly marine area	Breeding may occur within area
<i>Rostratula benghalensis s. lat.</i> Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area

Commonwealth Lands [[Dataset Information](#)]

Commonwealth Bank of Australia

Commonwealth Trading Bank of Australia

Communications, Information Technology and the
Arts - Telstra Corporation Limited

Transport and Regional Services - Airservices
Australia

Places on the RNE [[Dataset Information](#)]
Note that not all Indigenous sites may be listed.

Historic

- [Railway Station Group NSW](#)
- [School of Arts and War Memorial NSW](#)
- [Yarra Yarra Homestead and Outbuildings NSW](#)

Natural

- [Tabletop Nature Reserve NSW](#)

Extra Information

State and Territory Reserves [[Dataset Information](#)]

- Benambra National Park, NSW
- Downfall Nature Reserve, NSW
- Mullengandra Nature Reserve, NSW
- Nest Hill Nature Reserve, NSW
- River Murray Reserve Natural Features Reserve - River Murray Reserve, VIC
- Tabletop Nature Reserve, NSW
- Wiesners Swamp Nature Reserve, NSW
- Woomargama National Park, NSW

Regional Forest Agreements [[Dataset Information](#)]
Note that all RFA areas including those still under consideration have been included.

- North East Victoria RFA, Victoria
- Southern RFA, New South Wales

Caveat

The information presented in this report has been provided by a range of data sources as [acknowledged](#) at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the *Environment Protection and Biodiversity Conservation Act 1999*. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under "type of presence". For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the [migratory](#) and [marine](#) provisions of the Act have been mapped.

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as [extinct or considered as vagrants](#)
- some species and ecological communities that have only recently been listed
- [some terrestrial species](#) that overfly the Commonwealth marine area
- migratory species that are very [widespread, vagrant, or only occur in small numbers](#).

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgments

This database has been compiled from a range of data sources. Environment Australia acknowledges the following custodians who have contributed valuable data and advice:

- [New South Wales National Parks and Wildlife Service](#)
- [Department of Sustainability and Environment, Victoria](#)
- [Department of Primary Industries, Water and Environment, Tasmania](#)
- [Department of Environment and Heritage, South Australia Planning SA](#)
- [Parks and Wildlife Commission of the Northern Territory](#)
- [Environmental Protection Agency, Queensland](#)
- [Birds Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [Queensland Herbarium](#)
- [National Herbarium of NSW](#)
- [Royal Botanic Gardens and National Herbarium of Victoria](#)
- [Tasmanian Herbarium](#)
- [State Herbarium of South Australia](#)
- [Northern Territory Herbarium](#)
- [Western Australian Herbarium](#)
- [Australian National Herbarium, Atherton and Canberra](#)
- [University of New England](#)
- Other groups and individuals

[ANUCLIM Version 1.8, Centre for Resource and Environmental Studies, Australian National University](#) was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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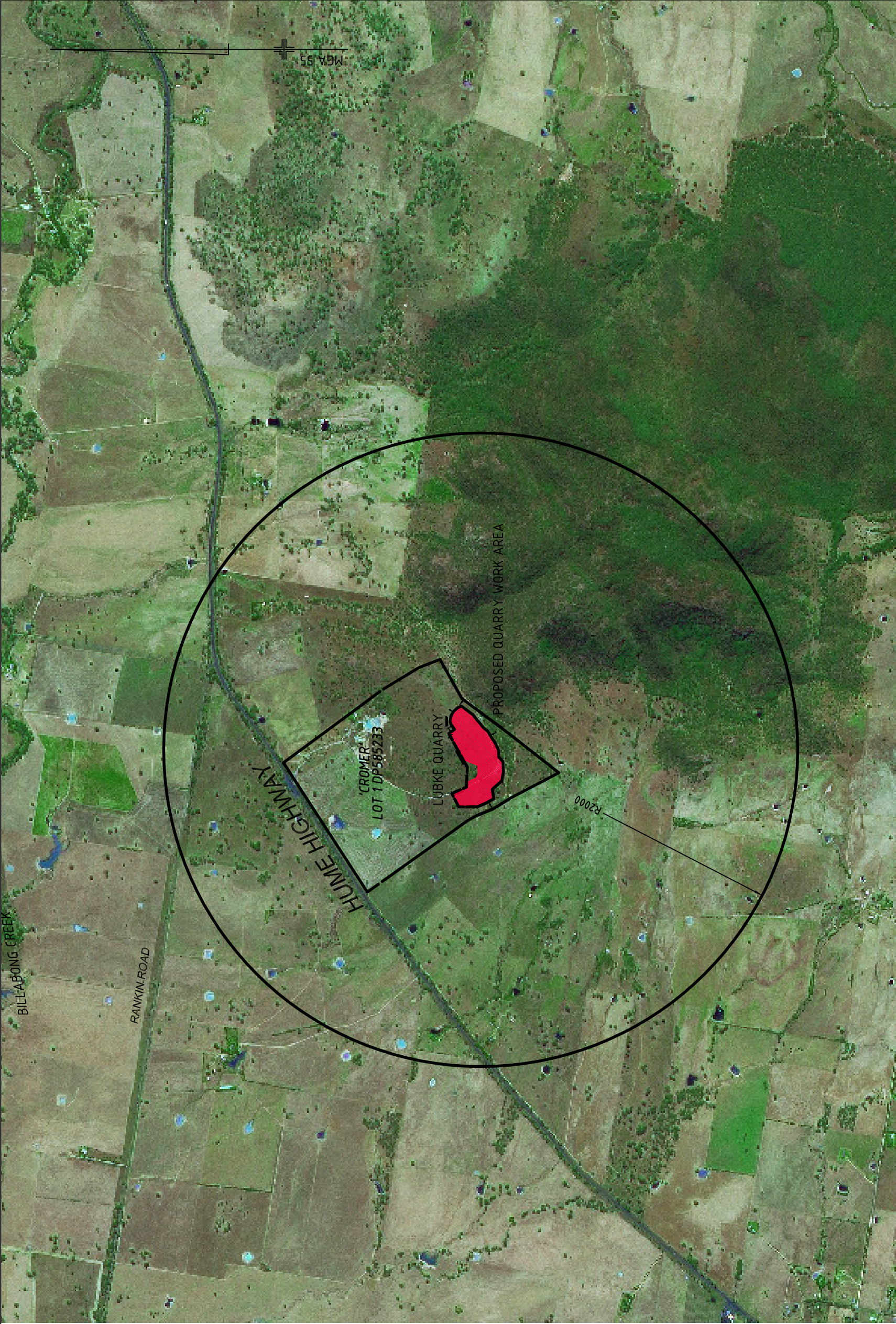
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Appendix 7: Proposed Work Area Plan

Appendix 8: Tree Cover Density Within a 2km Radius



blueprint
PLANNING
& DEVELOPMENT

SURVEYORS REF:
6567
VERSION
3



ORIGINAL
SCALE
1:25000
SHEET
SIZE
A3

NOTES
BASE IMAGERY DATA FROM
WWW.MAPS.NSW.GOV.AU
RAYTHEON CNES 2006
COLOUR SATELLITE IMAGERY
MEDIUM RESOLUTION

TREE COVER PLAN
LUBKE QUARRY EIS
HUME HIGHWAY, HOLBROOK

Appendix 9: Rehabilitation and Native Vegetation Offset Replanting Plan

**REHABILITATION AND NATIVE VEGETATION OFFSET
REPLANTING PLAN**

for the

**LUBKE QUARRY
'CROMER', HUME HIGHWAY, HOLBROOK**

May 2007

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1.0 OBJECTIVES

- To identify the final use of the site.
- To identify 'offset' areas, revegetation areas, the revegetation program, fencing and the management and maintenance program.

2.0 FINAL USE OF SITE

According to DUAP 1996 *Extractive Industries: Quarries EIS Guidelines*, the final use of the quarry works area will be for agricultural grazing, however other areas will be set aside permanently as 'offsets' for the loss of threatened species' habitat. These offset areas will be established and maintained with no stock access (other than for fire hazard abatement). The quarry 'cliff' faces will be fenced to prevent risk to stock and humans.

3.0 SUITABILITY OF THE REHABILITATED SITE (QUARRY WORKS AREA) FOR AGRICULTURAL PRODUCTION

Subject to stock access as detailed above, the quarry works area will be suitable for agricultural production. Topsoil stripped and stored as overburden during quarry establishment in the mid-1980s and arising from proposed establishment works will be used to re-establish pasture. (Note topsoil should not be placed into 'offset' areas.)

4.0 REHABILITATION (End of Quarry Life)

4.1 Quarry Works Area

- The quarry rock faces and benches to be left in a stable condition.
- Bench surfaces to be covered with scattered boulders and rocks of varying sizes to provide reptile habitat. Strategically place rock upon rock. Strategically place hollow logs and fallen timber. Quarried areas are known to provide potential habitat for a number of fauna species, particularly reptiles. Avoid dense plantings on or near outcrops as significant canopy cover can create shade levels too high for long-term reptile occupation.
- Quarry work area surface to be re-topsoiled using stockpiled topsoil. In the rocky areas, where possible, soil and overburden native to the site to be spread to provide a planting medium for native vegetation, then revegetate by sowing with seed and/or planting a selection of the following species:

Acacia acinacea	Gold-dust wattle
Acacia implexa	Hickory/Lightwood
Acacia rubida	Red-stem wattle
Acacia verniciflua	Varnish wattle
Allocasuarina verticillata	Drooping She-oak
Callitris endlicheri	Black Cypress-pine
Correa reflexa var. reflexa	Common Correa
Daviesia latifolia	Hop-bitter pea
Dillwynia retorta	Small-leaf Parrot-pea
Dillwynia phylloides	Parrot pea
Dodonea viscosa ssp. angustissima	Narrow-leaf Hop-bush
Dodonea viscosa ssp. cuneata	Wedge-leaf Hop-bush
Eucalyptus dealbata	Tumble-down Red Gum
Grevillea lanigera	Woolly Grevillea
Indigofera adesmiifolia	Tick Indigo
Indigofera australis	Austral Indigo
Stypanandra glauca	Nodding Blue Lily

Key: Preferred species

- Plant revegetation species at 20:80 ratio of trees/shrubs, i.e. 20% trees. Native grasses such as Wallaby grasses, Red-leg grass, Purple Wire grass should also be broadcast or sown at the rate of 5-10kg/ha in open areas.
- Sow pasture grasses outside rocky areas.

5.0 NATIVE VEGETATION OFFSET REPLANTING (Start of Quarry Life)

A revegetation schedule for the 'offset' areas is provided in section 5.1.4.

5.1 'Offset' Areas

5.1.1 Management Targets

The targets for the management of the offset areas are:

- Protect and improve the biodiversity values of the site (i.e. there is no net impact on threatened species or native vegetation).
- Maintain the tree canopy cover.
- Maintain and increase the cover and diversity of understorey life forms.
- Maintain and increase the recruitment of woody plant species.
- Maintain the cover of branches and organic litter.
- Create and maintain wildlife corridors.
- Prevent the extinction of threatened species.
- Protect the long term viability of local populations of a species, population or ecological community.

5.1.2 Landholder commitments

1. Use of the 'offset' areas:

For the life of the quarry, from commencement, the landholder agrees to:

- Retain all standing large trees (dead or alive);
- Retain all other standing trees (dead or alive);
- Retain all fallen timber and organic litter;
- Exclude stock from the site except for the express purpose of fire hazard abatement (strategic) grazing;
- Control rabbits and other pests;
- Eliminate all high threat environmental woody weeds to <1% cover; and
- Control all other high threat (noxious) weeds.

2. Management of the land:

- The landholder will complete the management actions on the land as delineated on the Concept Rehabilitation and Native Vegetation Offset Replanting Plan (provided as a separate plan in the EIS) over the time periods specified in the Management Program (section 5.1.3), and will maintain the offset areas for the life of the quarry.
- Revegetation shall be as per the schedule provided in section 5.1.4.
- Rocks should be placed to act as a corridor for reptile movement between the north east section of the quarry and the boundary fencing of Cromer Hill.

5.1.3 Management program

TABLE 1: Activity Management Calendar 2007/2010

MANAGEMENT ISSUE	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1. NOXIOUS WEEDS	2007	Map for each major weed i.e. Patersons Curse, Sweet Briar, St. Johns Wort, Thistles											
	2007	Woody weed control as below. Cut & paste or frill. Leave <i>in situ</i> if removal not practical											
	2007	Sweet Briar control This will include: (a) mechanical removal of plants; or (b) chemical control by cutting & pasting with glyphosate or blanket spraying.											
	2007 & ongoing	Broad leaf weed control as below: Paterson's Curse (a) Spray Paterson's Curse rosettes as per (b) Scotch Thistle Star Thistle Spear Thistle (a) Grub out plants prior to flowering, taking care to remove bulk of the taproot. (b) Cultivate seedlings at rosette stage. Spray late summer/autumn seedlings with 2,4-D, MCPA or Dicamba (selective spray).											
								(a) Spray Paterson's Curse rosettes as per (b)		(b) Spray Paterson's Curse prior to flowering and seed set with high rate of MCPA or 2, 4-D by 4WD bike or vehicle with boom spray or spot spraying as required. OR use biological (weevil) control agent/grazing method. Contact Dpt. Agriculture for information. (c) Pull or spray flowering Paterson's Curse with glyphosate. In drainage lines use glyphosphate registered for use near aquatic areas. (a) Cultivate seedlings at rosette stage. (b) Spray late winter/spring seedlings < 30cm with 2,4-D, MCPA or Dicamba (selective spray).			

MANAGEMENT ISSUE	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
		Horehound Grub out & burn before flowering. Cultivate in summer & repeat as necessary. Spotspray surviving plants with 2,4-D, MCPA or Dicamba.							Spray regrowth				
2. ENVIRONMENTAL WEEDS	2007	Nettle Tree. One plant confined to higher elevation, west side of knoll. To prevent spread, control by cutting & pasting or 'frilling' with herbicide such as 50:50 'Grazon' & Kerosene or Diesel.											Spray regrowth
3. ANNUAL/ PERENNIAL PASTURE GRASS COMPETITION	2008	e.g. Wild Oats							Spot spray introduced grasses as required to reduce competition to native plants.				
4. PEST ANIMALS	2007 & Ongoing	Locate and map rabbit warren locations. Integrated Pest Animal Control Program by ripping/fumigation/removal of harbour.											
		Fox control by baiting, fumigation & den destruction & shooting when numbers are low.											
		Feral Cat control by trapping, all year.											
		Stray/Pet Cat control by confining to home at night.											
5. STOCK CONTROL/ FENCING	2007 & ongoing	Removal of stock by fencing. Generally, remove barbed wire, especially where it occurs in the gliding path of Squirrel Gliders (between tree canopies which are closer than 90m apart). Use 5 or 7 strand plain wire with electric tape or wire on outrider. Strategically graze as per Section 8 below. Fencing of dam in Zone 5 to prevent stock access during strategic grazing periods should be considered if dam water is for household use.											

MANAGEMENT ISSUE	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
6. PLANTING PREPARATION	2007/2008	In Jan. 2008, order guards, stakes, fertilizer, mulch mats as per specifications for planting for July delivery.	In 2007/2008 – Fencing (to exclude grazing) of planting sites with 'wildlife friendly' fencing. Remove barbed wire where necessary to prevent gliders & other wildlife from becoming hooked up. Place access gates for maintenance purposes and for cattle access for strategic grazing for fire hazard abatement. Gather fallen limbs from area to be quarried and place into offset areas as breeding and refuge habitat for a number of wildlife, including the Brown Tree Creeper.	In 2008, Spot spray 1m diameter planting holes preferably in April and repeat spray with glyphosate 2 weeks prior to planting. If direct seeding, spray 0.5m wide drill line, as above. This is crucial to successful germination. In sites with good native ground cover avoid creating too much disturbance; avoid using sprays as these sites generally do not require any weed control. It is preferable to plant early in the season, after rains, when soil moisture is adequate.				Order plants in 2007 for 2008 planting delivery. If ordered now this will ensure supply of preferred species.					In year preceding planting, in areas with mainly introduced perennial and annual grasses and weeds, the year before planting, deep dry rip with one/two tyne ripper in gaps away from drip-line of existing trees to shatter the ground allowing autumn rains to penetrate deep into sub-soil and eliminate air pockets. Space rip-lines at least 4m apart if trees are to be planted. Cultivate rip-lines to control weeds and break down clods.

MANAGEMENT ISSUE	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC		
7. REVEGETATION	2008				Excavate pre-prepared planting holes by shovel/mattock or use of 'Hamilton tree planter'. Plant as per specifications, sparingly throughout the site, incorporating adjoining vegetation along watercourse, fertilize, water in to remove air pockets from root zone, mulch, stake & guard. (Refer to ' <i>Revegetation Techniques, a guide for establishing native vegetation in Victoria</i> ', Greening Australia, ISBN 1-875345-67-1. Plant as per Planting Schedule, plant clumps of trees 40m apart to connect arboreal habitat for gliders. Scatter plant shrubs around these trees and large old trees (outside drip-lines). See preferred planting locations on 'Offset" Protection area map. If direct seeding, late in the season (Aug-Sept) when soil moisture is adequate and soil temperature is on the increase, scalp soil with rake to disturb soil, hand disperse or use scalping/drilling/air seeding machine with pre-treated smoked seed e.g. Gumnut Seeding.										
	2008/2009				Monitor plant establishment & replace dead plants as required until a 75% success rate is achieved.										

MANAGEMENT ISSUE	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
8. FIRE HAZARD ABATEMENT & REVEGETATION OF NATIVE GRASS AREAS	2010 & Ongoing									After plants have established (5-8 years), in Spring, when introduced annual grasses are at their optimum growth stage, strategically graze annual/perennial pasture grasses by crash grazing for <u>short</u> periods only until hazard is reduced. A ploughed firebreak may also be provided where possible around the perimeter of the 'protection area', but outside the drip-line of trees.			
9. MONITORING	Ongoing	Monitoring weeds, pest animals & breaches of fencing (by windfall of trees or other) which allows stock access is ongoing and records should be maintained of all activities conducted. Annual photo evidence of 'before' and 'after' of all activities to be maintained. A report on the vegetation establishment success rate should be provided to the Council after the second and third years of implementation.											

*Note, To ensure that vegetation established by the Land Manager at the site has good genetic diversity, compatibility and character typical of indigenous plants that would have grown in the area of the site, when sourcing seedlings, records should be provided to the purchaser, by the nursery, of the provenance and collection location (hillside, etc.). This information should be maintained for future reference in case of plant failure.

* Note this table is a guide only and can be modified upon final control decisions for each species. Note that further information re pest animal control can be obtained from the Hume Rural Lands Protection Board, Albury (6040 4210)

5.1.4 Revegetation Schedule (offset areas)

LOCATION (Area No.)	GULLY DRAINAGE LINE (ZONE 3) (outside drip-line of existing trees) (Wildlife Corridor)		SOUTHERN OFFSET AREA (ZONE 4) (below 360m contour)		NORTHEAST OFFSET AREA (ZONE 5) – (above 360m contour)	
Landform	Low to Rising Country		Low to Rising Country		Rocky outcrop	
Vegetation type	White Box-Yellow Box-Blakely's Red Gum Woodland		White Box-Yellow Box-Blakely's Red Gum Woodland		Dry sclerophyll forest – Tumble-down Red Gum, Drooping She-oak & Currawang	
Geology & soils	Alluvium – sand, silt, gravel & clay; Red & yellow earths to sandy granite soils		Granite, gneissic granite & gneiss; Red & yellow earths to sandy granite soils		Mainly granite, gneissic granite & gneiss. Also quartzite, slate, phyllite, greywacke, hornfels & schist. Mainly sandy granite soils	
Trees (> 8m)	<i>Eucalyptus albens</i> <i>Eucalyptus blakelyi</i> <i>Acacia dealbata</i> <i>Acacia implexa</i> # <i>Eucalyptus bridgesiana</i> <i>Eucalyptus melliodora</i>	White Box Blakely's Red Gum Silver Wattle Hickory Apple Box Yellow Box	<i>Brachychiton populneus</i> <i>Eucalyptus albens</i> <i>Eucalyptus blakelyi</i> <i>Eucalyptus</i> <i>polyanthemos</i> <i>Eucalyptus bridgesiana</i> <i>Eucalyptus nortonii</i> <i>Eucalyptus macrorhyncha</i>	Kurrajong White Box Blakely's Red Gum Red Box Apple Box Bundy Red Stringybark	<i>Eucalyptus dealbata</i> <i>Acacia doratoxylon</i> <i>Allocasuarina verticillata</i>	Tumbledown Red Gum Currawang Drooping She-oak
	<i>Bursaria spinosa</i> <i>Leptospermum continentale</i> <i>Kunzea ericoides</i>	Sweet Bursaria Prickly Tea Tree Burgan	<i>Acacia genistifolia</i> <i>Acacia lanigera</i> <i>Acacia paradoxa</i> <i>Acacia rubida</i> <i>Acacia verniciflua</i> <i>Bursaria spinosa</i> <i>Daviesia latifolia</i> <i>Dillwynia sericea</i> <i>Dodonea viscosa</i> <i>angustissima</i> <i>Grevillea floribunda</i> <i>Indigofera australis</i> <i>Pultenea foliolosa</i> <i>Platylobium formosum</i>	Spreading Wattle Woolly Wattle Hedge Wattle Red-stem Wattle Varnish Wattle Sweet Bursaria Hop Bitter-pea Silky Parrot-pea Long-leaf Hop Bush Seven dwarfs Grev. Austral Indigo Soft Bush-pea Showy Parrot-pea	<i>Acacia buxifolia</i> <i>Acacia rubida</i> <i>Brachyloma daphnoides</i> <i>Cassinia aculeata</i> <i>Daviesia latifolia</i> <i>Daviesia ulicifolia</i> <i>Grevillea lanigera</i> <i>Grevillea polybractea</i> <i>Indigofera adesmiifolia</i> <i>Kunzea parvifolia</i> <i>Stypandra glauca</i>	Box-leaf Wattle Red-stem Wattle Daphne Heath Common Cassinia Hop Bitter Pea Gorse Bitter-pea Woolly Grevillea Crimson Grevillea Tick Indigo Violet Kunzea Nodding Blue Lily
Shrubs (1.5–8m)						

						<i>Persoonia rigida</i>	Hairy Geebung
Groundcovers (plant at toe of bank)	<i>Carex appressa</i> <i>Juncus</i> spp. <i>Microlaena stipoides</i>	Tall Sedge Rush Weeping Grass	<i>Aristida ramosa</i> <i>Austrostipa</i> spp. <i>Austrodanthonia</i> spp. <i>Bothriochloa macra</i> <i>Dianella revoluta</i> <i>Geranium</i> spp. <i>Hardenbergia violacea</i> <i>Hibbertia obtusifolia</i> <i>Isotoma axillaris</i> <i>Themeda triandra</i> <i>Glycine clandestine</i> <i>Hibbertia sericea</i>	Purple Wire Grass Spear Grass Wallaby Grass	<i>Austrostipa</i> spp. <i>Austrodanthonia</i> spp. <i>Bothriochloa macra</i> <i>Dianella longifolia</i> <i>Geranium</i> spp.	Spear Grass Wallaby Grass	
				Red-leg Grass Black-anther Flax Lily Cranesbill Sarsparilla	<i>Hardenbergia violacea</i> <i>Hibbertia obtusifolia</i> <i>Isotoma axillaris</i> <i>Themeda triandra</i> <i>Glycine clandestine</i> <i>Hibbertia sericea</i> <i>Lissanthe strigosa</i>	Red-leg Grass Tall Flax Lily Cranesbill Sarsparilla Grey Guinea Flower Rock Isotome Kangaroo Grass Twining Glycine Silky Guinea Fl. Peach Heath	
Planting densities	50 plants/ha (Woodland effect)	50 plants/ha (Woodland effect)	50 plants/ha (Woodland effect)	50 plants/ha (although this is a Dry sclerophyll forest/Woodland site it requires maintaining as grassy woodland for Diamond Firetail)			

Stelling F 1998, *South West Slopes Revegetation Guide*, General Native Vegetation Profile: Holbrook, and Yarra Yarra catchments. DEC, *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community Species List*.

Key: Preferred species

5.1.5 Revegetation Contacts

Tree, shrub and grass seed

- Murray Indigenous Seed Centre, Albury (6051 9881)
- Native Seeds Pty Ltd (03) 9555 1722 <www.nativeseeds.com.au>

Plant material (tube stock)

- Jayfields Farm Trees, Holbrook, 6036 7235.

Direct seeding

- Bryan Ward, *Gumnut Seeding*, Mullengandra (6020 3250)