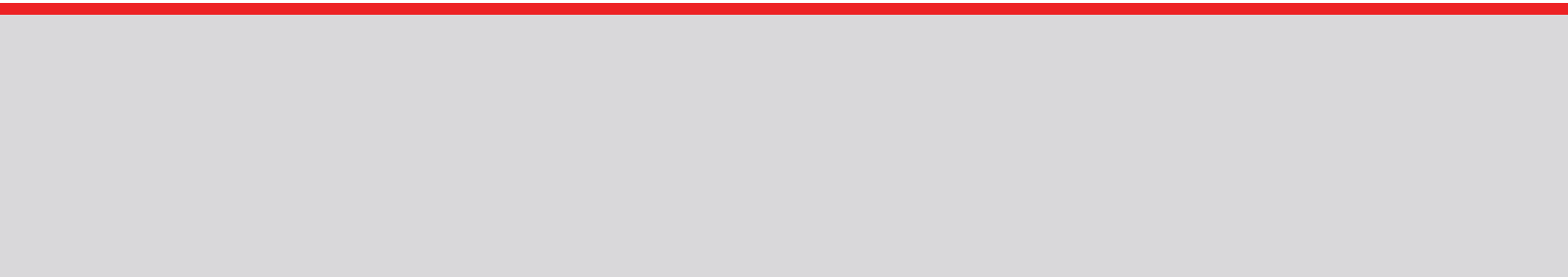


Appendix F

Flora and Fauna Impact Assessment







Jandra Quarry Intensification Project

Flora and Fauna Impact Assessment 2014

Prepared for Element Environment

Document control

Project No.: 1635

Document Description: Flora and Fauna Impact Assessment

Report prepared for: Element Environment

Project Director: Rhidian Harrington

Project Manager: Frank Lemckert

Authors: Charlotte Eriksson

Internal Review

Document Status Draft

Local Government Area Greater Taree

| Revision | Internal Review | External Review | Date Issued | Signature |
|----------|-----------------|------------------|-------------|--|
| D0 | Mark Aitkens | | 14/02/2014 | |
| D1 | Frank Lemckert | | 16/02/2014 |  |
| R0 | | Neville Hattingh | 24/02/2014 | |
| R1 | Simon Tweed | | 3/06/2014 | |
| R2 | | Neville Hattingh | 24/06/2014 | |

Niche Environment and Heritage

A specialist environmental and heritage consultancy.

Head Office

Niche Environment and Heritage
PO Box W36
Parramatta NSW 2150
Email: info@niche-eh.com
All mail correspondence should be through our Head Office

Sydney

0488 224 888

Central Coast

0488 224 999

Illawarra

0488 224 777

Armidale

0488 224 094

Newcastle

0488 224 160

Brisbane

0488 224 036

Cairns

0488 284 743

© Niche Environment and Heritage, 2014

Copyright protects this publication. Except for purposes permitted by the Australian *Copyright Act 1968*, reproduction, adaptation, electronic storage, and communication to the public is prohibited without prior written permission. Enquiries should be addressed to Niche Environment and Heritage, PO Box W36, Parramatta NSW 2150, Australia, email: info@niche-eh.com.

Any third party material, including images, contained in this publication remains the property of the specified copyright owner unless otherwise indicated, and is used subject to their licensing conditions.

Cover photograph: Vegetation within the finished product stockpile extension area

Executive Summary

Introduction

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by Element Environment to prepare a Flora and Fauna Impact Assessment (FFIA) relating to proposed modifications of the existing development consent for Jandra Quarry, south of Taree in NSW.

The proponent Holcim (Australia) Pty Ltd (Holcim) is proposing an increase in the production and transportation of finished quarry products from 250,000 tonnes per calendar year to 475,000 tonnes per calendar year. The key changes to the approved operations that have the potential to result in fauna and flora impacts include:

- ❑ Construction of a new heavy vehicle access road to separate inbound heavy vehicles from outbound heavy and light vehicles resulting in the clearing of 0.25 hectares of vegetation;
- ❑ Expansion of the finished product stockpile area resulting in the clearing of 1.034 hectares of vegetation within the current quarry boundary;
- ❑ Extension of operating hours to include weekday evenings (6 am to 10 pm Monday to Friday) and full day Saturday (6 am to 10 pm) including the return of trucks from Newcastle haul to midnight.

Aims

The aim of this report is to describe the ecological values within a designated study area that will contain the key changes to the approved operations. The report:

- a) Describes the biodiversity values of the study area;
- b) Identifies biodiversity values that may be impacted by the proposed changes under either the TSC and/or EPBC Acts;
- c) Provide impact assessments for biodiversity constraints where it is identified that there is a moderate or higher likelihood of occurrence; and
- d) Delineate opportunities for impact avoidance and mitigation to minimise impacts on threatened fauna habitat.

Methods

An initial database and literature search was undertaken to identify species and ecological communities known from within 10km of the designated study area. This was followed by a site survey completed on 7th February 2014 to undertake vegetation sampling and habitat assessment using field survey methods described in DEC (2004), Phillips and Callaghan 1995 and DECCW (2009). The methods used included BioMetric plots, targeted surveys for *Cryptostylis hunteriana* (Leafless Tongue-orchid), Spot Assessment Technique (SAT) plots to document Koala activity, habitat assessment for threatened fauna and flora, call playback (targeting the Koala) and spotlighting surveys to locate and identify nocturnal fauna.

Results

The database assessment identified a total of 66 threatened species previously recorded from within 10km of the study area. The vegetation assessment identified that the study area did not contain any areas of EEC. No threatened plants were recorded. One threatened species and one migratory species were located during the fauna surveys: the Grey-headed Flying Fox and Rufous Fantail respectively. Seven hollow-bearing trees were detected within the impact area and require consideration in relation to impacts on threatened fauna habitat. Suitable Koala feed trees were present within the study area and at a density sufficient to warrant classification as potential Koala habitat as defined by SEPP 44. However, the SAT plots did not locate any likely Koala scats and no Koalas were located during the spotlight or through call playback indicating that core Koala habitat is not present within the study area.

Impact Assessments

The study area does not contain any EECs that need consideration during clearing. One threatened orchid, the Eastern Underground Orchid, is considered to have a moderate probability of occurring on the study site and so required assessment. There are 22 species of threatened/migratory fauna considered to have a moderate or higher probability of occurrence within the study area that also needed assessment. These assessments concluded that there would not be a significant impact on any of the fauna under either the TSC or EPBC Acts. This is based on the very small area of vegetation to be cleared (1.284 ha), the fact that the vegetation to be cleared is already generally degraded through edge effects or isolation and that the area subject to intensification impacts has already been subject to those impacts for more than 25 years. The loss of seven hollow bearing trees will be offset through the provision of compensatory nest boxes at a ratio of 2:1 to the hollows being lost.

Appropriate surveys have not been completed for the Eastern Underground Orchid and so its presence has been assumed and the impact assessments concluded a significant impact was likely to occur for this species. Targeted surveys are to be undertaken in spring in order to allow an accurate assessment of the impacts on this species to be undertaken and any relevant mitigation to be determined and implemented.

The proposed expanded finished stockpile area contains Koala feed trees at a suitable density with the potential to be identified as core Koala habitat. However the lack of records from previous surveys, the paucity of records within 20km present on the databases and the failure to locate any individuals during the site survey all indicate an unlikely occurrence of a koala population being present within the study area. Consequently, the study area does not contain core Koala habitat and the proposal will not need further consideration either in regards to a Referral under the *Environmental Protection and Biodiversity Conservation Act 1999* or the development of a Koala Plan of Management.

Mitigation

Mitigation proposed to minimise environmental impacts through the proposed works are the provision of a two-stage tree clearing procedures to prevent injury to any fauna using the tree hollows, installation of nesting boxes to offset the removal of hollows and targeted surveys for the Eastern Underground Orchid to either ensure its absence or determine suitable mitigation should it be located.

Table of Contents

| | |
|---|-----------|
| 1. Introduction | 6 |
| 1.1 Background | 6 |
| 1.2.1 Location | 6 |
| 1.2.2 Project Description | 6 |
| 1.3 Aim | 7 |
| 2. Methods | 8 |
| 2.1 Literature and database review | 8 |
| 2.2 Threatened Flora and Fauna Likelihood of Occurrence | 8 |
| 2.3 Field methods | 9 |
| 3. Results | 11 |
| 3.1 Desktop Review | 11 |
| 3.2 Flora | 15 |
| 3.3 Fauna | 16 |
| 4. Impact Analysis | 19 |
| 4.1 Project Impacts | 19 |
| 4.2 Affected Threatened Biodiversity | 21 |
| 5. Conclusion | 24 |
| 6. References | 25 |
| Figures | 27 |
| Appendices | 32 |
| Appendix 1: Flora List | 33 |
| Appendix 2: Impact Assessments | 34 |
| Appendix 3: Staff CVs | 70 |

List of Tables

| | |
|--|----|
| Table 1. Likelihood of Occurrence Criteria | 7 |
| Table 2. Threatened flora, fauna and ecological communities recorded within the locality | 13 |
| Table 3. Threatened Flora and Fauna species that may occur within the locality | 14 |
| Table 4. Fauna species recorded within the study area | 16 |
| Table 5. Affected threatened flora species | 21 |
| Table 6. Threatened fauna species located within 10km of the study area | 21 |

1. Introduction

1.1 Background

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by Element Environment to prepare a Flora and Fauna Impact Assessment (FFIA) to inform a Background Scoping Document and Environmental Assessment, to support modifications to the existing development consent for Jandra Quarry (the Project). The Background Scoping Document was submitted to and accepted by NSW Planning and Environment (P&E) as part of the first phase of the planning approval process.

1.2.1 Location

Jandra Quarry is located at Possum Brush, approximately 17 km south of Taree, NSW (Figure 1).

1.2.2 Project Description

Jandra Quarry is currently operating under development consent (DA231-10-99) with an approved extraction rate of 250,000 tonnes per calendar year. Holcim is seeking to modify the development consent to provide for the production and transportation of a maximum of 475,000 tonnes of finished quarry products per calendar year, with an approval period of 30 years (refer to the Environmental Assessment for a detailed description of the proposed modification).

The existing approved quarry pit design, as detailed in the 1999 EIS, has a depth limit of RL20 and (at the time) contained 16.5 million tonnes (Mt) of fresh rock. To date, Holcim has extracted and processed in the order of 3 Mt of this resource. It is not proposed to increase extraction of the overall resource and therefore no modification to the approved quarry pit disturbance area is proposed or considered necessary.

The key changes to the approved operations that have the potential to result in fauna and flora impacts include:

- Construction of a new heavy vehicle access road to separate inbound heavy vehicles from outbound heavy and light vehicles (refer Figure 2);
- Expansion of the finished product stockpile area (refer Figure 2);
- Extension of operating hours to include weekday evenings (6 am to 10 pm Monday to Friday) and full day Saturday (6 am to 10 pm) including the return of trucks from Newcastle haul to midnight.

The proposed heavy vehicle access road will result in the removal of 0.25 hectares of vegetation. This chosen route will follow the periphery of the cleared site facilities area and so minimise the requirement to remove vegetation and will also avoid fragmentation of the local vegetation. The vegetation to be removed is also subject to increased light and wind disturbance (edge effects) due to it being adjacent to cleared lands and so represents lower quality habitat for fauna and flora.

The enlargement of the existing finished product stockpile area requires the removal of an additional 1.034 hectares of vegetation. The area to be cleared is located in the centre of the operating quarry (Figure 2), between the existing cleared site facilities and overburden emplacement areas and so will again minimise the area of native vegetation required to be removed, as well as restrict the removal to vegetation already fragmented from the surrounding habitat.

These proposed works will thus involve the clearing of a total of 1.284 ha of native vegetation within the proposed disturbance footprint (see Figure 2), necessitating a requirement for this FFIA.

For the remainder of this report the study area will refer to the area within and immediately surrounding the proposed disturbance footprint as identified in Figure 3.

1.3 Aim

The aim of this report is to describe and assess the impacts of the proposed changes to the ecological values within the study area. The approach of this investigation includes the following:

- Describe the biodiversity values of the study area;
- Identify potential biodiversity constraints located within the study area with reference to threatened biodiversity listings on the TSC Act and EPBC Act;
- Provide impact assessments for biodiversity constraints where it is identified that there is a moderate or higher likelihood of occurrence; and
- Delineate opportunities for impact avoidance and mitigation to minimise impacts on threatened fauna habitat.

Tasks involved in addressing these aims include:

- Undertake a literature review of relevant ecological assessments within and adjacent to the study area;
- Undertake relevant database searches of threatened flora and fauna species, populations and ecological communities within a 10km radius of the study area;
- Identify threatened flora and fauna species, populations and ecological communities listed on the TSC Act and or EPBC Act that are known or likely to occur within the study area;
- Identify and update existing vegetation communities;
- Undertake 7 part tests under Section 5a of the Environmental Planning and Assessment Act and under the EPBC Act for relevant threatened species/communities with a moderate or higher likelihood of occurrence; and
- Identify appropriate adaptive management actions to avoid and mitigate impacts.

2. Methods

The following sections describe the extent of desktop and field investigations (i.e. methods and effort) used to prepare this assessment.

2.1 Literature and database review

Literature and data sources reviewed included:

- Jandra Quarry Extension Environmental Impact Statement (ERM 1999);
- OEH Atlas of NSW Wildlife (accessed February 2014);
- EPBC Act Protected Matters Search Tool (accessed February 2014);
- Jandra Quarry Statement of Environmental Effects for Enlargement of an Overburden Emplacement Area (CSR Readymix 2002);
- Jandra Quarry Clarification of Production and Transportation Limits Environmental Assessment (Umwelt 2011).

The Threatened Species Database (OEH 2014a) was also reviewed, where appropriate, to describe the habitat conditions typically occupied by threatened species, populations and ecological communities identified as having the potential to occur within the locality.

Finally, a review of the scientific literature was undertaken in order to provide information indicating the likely impacts of increased hours of activity of the quarry. This search attempted to identify studies that indicated how fauna/flora respond to increased periods of noise and lighting and increased periods of dust production.

2.2 Threatened Flora and Fauna Likelihood of Occurrence

A list of subject threatened flora and fauna within the locality (10 kilometre radius) was determined from database searches (OEH Atlas of NSW Wildlife and EPBC Act Protected Matters Search Tool). The list of potentially impacted species is determined from consideration of this list. In order to adequately determine the relevant level of assessment to apply to subject species, further analysis of the likelihood of those species occurring within the Study area was completed.

Five categories for 'likelihood of occurrence' (Table 1) were attributed to species after consideration of criteria such as known records, presence or absence of important habitat features on the subject site, results of the field surveys and professional judgement. This process was completed on an individual species basis.

Table 1. Likelihood of Occurrence Criteria

| Likelihood rating | Threatened flora criteria | Threatened and migratory fauna criteria |
|-------------------|---|---|
| Known | The species was observed within the Study area. | The species was observed within the Study area. |
| High | It is likely that a species inhabits the Study area. | It is likely that a species inhabits or utilises habitat within the Study area. |
| Moderate | Potential habitat for a species occurs on the site. Adequate field survey would determine if there is a 'high' or 'low' likelihood of occurrence for the species within the Study area. | Potential habitat for a species occurs on the site and the species may occasionally utilise that habitat. Species unlikely to be wholly dependent on the habitat present within the Study area. |

| Likelihood rating | Threatened flora criteria | Threatened and migratory fauna criteria |
|-------------------|--|--|
| Low | It is unlikely that the species inhabits the Study area. | It is unlikely that the species inhabits the Study area. If present at the site the species would likely be a transient visitor. The site contains only very common habitat for this species which the species would not rely on for its on-going local existence. |
| Nil | The habitat within the Study area is unsuitable for the species. | The habitat within the Study area is unsuitable for the species. |

2.3 Field methods

A preliminary field inspection of the vegetation within the study area was undertaken by two ecologists on the 16th of December 2013, with an emphasis on determining the presence of any Endangered Ecological Communities (EECs) or threatened species. This covered approximately two hours of time walking across the study area. A more detailed field survey was subsequently undertaken on the 7th of February 2014, using methods described in the following sections. The conditions at the time of the survey was mild with daytime temperatures being above 25C and with rain having fallen in the previous week, but with clear conditions at the time of the survey. The survey commenced at approximately 2:30PM in the afternoon allowing for five hours to search the site for fauna, flora and habitat features as well as undertake the SAT and BioMetric plots. This was followed by two hours of spotlighting to locate nocturnal fauna.

2.3.1 Flora Survey

One BioMetric plot, performed in accordance with Gibbons et al (2009), was completed within the study area (Figure 4). The survey included a 20 metre by 20 metre floristic quadrat nested within a larger 50 metre by 20 metre plot, which is designed to sample habitat condition including vegetation structure, presence of weeds, fallen logs and hollows. Site attribute scores measured within the plot are listed as follows:

- Native plant species richness (NPS);
- Native overstorey cover (NOC);
- Native mid-storey cover (NMS);
- Native groundcover stratum grasses (NGSG);
- Native groundcover stratum shrubs (NGSS);
- Native groundcover other (NGSO);
- Exotic plant cover (EPC);
- Number of trees with hollows (NTH);
- Overstorey regeneration (OR); and
- Total length of fallen logs (FL).

Additional species observed outside the BioMetric plot were recorded as part of a random meander survey of the study area. Targeted threatened flora searches were conducted for species that may have been observable at the time of the survey. Habitat assessments were conducted for species not observed at the time of the survey, particularly *Rhizanthella slateri* (Eastern Underground Orchid).

2.3.2 Fauna Survey

The following fauna survey methods were undertaken as part of this FFIA:

Habitat Assessment: Habitat suitability for threatened fauna species was identified in the desktop investigations as part of the likelihood of occurrence analysis. This was completed by identifying important habitat features such as, hollow-bearing trees and streams. All hollow-bearing trees were marked with flagging tape and GPS recorded (Figure 4).

Opportunistic surveys: visual surveys undertaken for fauna and flora species within the study area, limited to direct observation, call recognition, or scat/track recognition.

SAT: Two Spot Assessment Technique (SAT) plots were undertaken within the study area to assess whether the area is utilised by Koalas (Figure 4) following the methods detailed by Phillips and Callaghan (1995). A centre tree known or considered to be of potential importance to Koalas was marked with a GPS and a one minute visual search, followed by a one minute active search of leaf litter, was undertaken within a one metre radius of the trunk in order to locate Koala faecal pellets. The method was then repeated around the base of the nearest 29 trees to the centre tree, provided they were an identified feed species and had a diameter at breast height of at least 10 cm. Tree species, diameter at breast height (DBH) and scratches were recorded for each tree.

Spotlighting: A nocturnal survey targeting primarily Koalas was conducted by two ecologists and consisted of 1.5 hours spotlighting on foot (total 3 person hours) and a 20 min call playback survey (Figure 4). Pre-recorded calls of a Koala were broadcast in an effort to elicit a vocal response or to attract a Koala to the survey site. As described by Kavanagh and Peake (1993), the call was broadcast for at least five minutes, followed by five minutes of listening, and stationary spotlighting. Following the final broadcast and listening, the area was spotlighted on foot.

3. Results

3.1 Desktop Review

3.1.1 Literature Review

Flora

ERM (1999) used random meanders and aerial photographs to delineate plant communities, habitats and threatened species. Neither ERM (1999) nor CSR Readymix (2002) found any threatened flora during their surveys.

Fauna

A variety of field survey methods was used by ERM (1999) including spotlighting, avifaunal surveys, ultrasonic bat detection, hair tube sampling, and reptile and amphibian surveys. Two threatened species were recorded within the development consent boundary: the Eastern Falsistrelle (*Falsistrellus tasmaniensis*) and the Grey-headed Flying Fox (*Pteropus poliocephalus*) (ERM 1999).

CSR Readymix (2002) conducted diurnal habitat assessments, spotlighting, call playback, stagwatching, amphibian searches and anabat detection. One threatened species was recorded in the development consent boundary: Eastern Freetail-bat (*Mormopterus norfolkensis*) (CSR Readymix 2002).

Koala Surveys

The abundance of each tree species within 20 metre x 50 metre plots was recorded to detect potential Koala habitat by ERM (1999). Core Koala habitat was assessed by searching for Koala faecal pellets beneath listed feed tree species within a 2 m radius. The Koala habitat assessment determined that land within the development consent boundary contains potential Koala habitat. No Koalas or Koala scats were observed, with the only evidence from the site being an anecdotal observation of a koala in a tree somewhere on the quarry lands made by an employee at the Quarry. It was therefore, concluded that land within the development consent boundary did not contain core Koala habitat, which had been agreed to by the [then] Department of Urban Affairs and Planning (ERM 1999).

Similarly, CSR Readymix (2002) found land within the development consent boundary to contain potential Koala habitat. Scat searches, eight hours of spotlighting, Koala call playback (2 nights) and random meanders were used to determine whether the site would be classified as core Koala habitat. No Koalas or scats were found and land within the development consent boundary was therefore not considered to be core Koala habitat. Consequently, it was concluded that core Koala habitat provisions of SEPP 44 did not apply to the proposed enlargement of the overburden emplacement area, a position supported by the then Department of Planning.

Impacts of Noise, Light and Dust

The impacts of anthropogenic produced noise and light have been the subject of a number of recent studies given the concerns expressed about increasing levels of urbanisation around the world. It has been found that traffic noise can mask the important contact calls of the budgerigar, canary, and Zebra Finch, (Lohr et al. 2003) with the spectral distribution of traffic noise being able to substantially reduce the distance over which the calls could be detected. Parris and Schneider (2008) found traffic noise to have negative impacts on two species of birds in Victoria, but that it was increased volumes of noise and not increased volumes of traffic that were important. Various studies have indicated that changes in bird calls

in response to traffic noise, and so presumably other human created noises follow two paths. Either the birds change the characteristics of their call to avoid interaction of the sound of the call with the created sounds or they limit calling to periods when the levels of noise are reduced. Frogs show a similar pattern with Hoskins and Goosem (2010) and Parris et. al. (2009) finding that frogs change the frequency and structure of calls to minimise interference and may abandon an area if the noise levels are too great. However, breeding sites adjacent to roads with only moderate or lower levels of traffic were readily used indicating that only sites with high volumes of traffic (usually highways) created a significant noise impact that frogs avoided.

Visual impacts of roads have been little tested and the evidence is inconclusive in regards to general impacts. Reijnen et al. (1995) tested for the impacts of visual disturbance on birds and found little evidence that this was an issue, but vehicles can reduce the breeding success of ground-nesting birds in open coastal habitats (McGowan and Simons 2006). The response is almost certainly dependent on how birds use the roadside habitats. In areas of open or closed forest with only minor road use by slow trucks, the visual impacts are unlikely to be great due to the general screening of the vehicles.

Increased levels of anthropogenic light has been assessed for birds, bats and frogs and indicates that such light can have a significant negative impact on all of these groups. Dominoni et. al. (2014) found that onset of the daily activity of blackbirds was significantly advanced in both urban sites compared to the rural population although end of daily activity did not vary. Furthermore, birds tended to be active earlier in the morning and later in evening in urban areas in the early breeding season than at later stages. However, whether this resulted in negative impacts is unclear. However, previous research by the same author (Dominoni et. al. 2013) suggested that the increased levels of artificial light in urban areas may have an impact on the development of the reproductive system of birds. A laboratory study of *Rana clamitans* (Baker and Richardson 2006) found that when exposed to artificial light, frogs produced fewer advertisement calls and moved more frequently than under ambient light conditions reducing their potential to attract mates, although it was not clear if this led to negative outcomes. Lewanzik et. al. (2014) found in a laboratory study that artificial light reduced the foraging activity of frugivorous bats and so could impact on ecosystems. These impacts were evident where lighting was provided constantly, even at low levels, and would not be so pronounced where lights were switched off through some or most of the night allowing normal activities to resume. When and for how long this happened is of importance in assessing impacts as will be the species in question. This is clearly demonstrated by an assessment of mammal responses to varying levels of moonlight, which can be extrapolated to impacts of increased artificial light, by Prugh and Golden (2014). They found that the response of increased light depended on the species and its main sensory mode. Those that used eyesight to forage and avoid predators tended to increase activity during periods of full moonlight whereas species reliant on other senses (smell, hearing), tended to become less active.

The impact of increased dust levels has been researched for plants, but there is no real study as to possible direct impacts on animals. Farmer (1993) provided a good review of the impacts of dust on vegetation in relation to mining and roads and found that, as would be expected, the impacts were variable between studies and could be both positive and negative and the extent that dust would impact any tree or community could not easily be predicted. He noted that dust may also exacerbate secondary stresses, such as drought, insects and pathogens, or allow penetration of toxic metals or phytotoxic gaseous pollutants. Effects of dust on natural communities may alter the competitive balance between species in a community and any changes in the vegetation may also affect invertebrate communities that could also alter cycles of decomposition.

3.1.2 Database Searches

A database search of the locality has identified (15 threatened flora species and 50 threatened fauna species that may potentially occur within the study area (OEH 2014b, DoE 2014). These species are listed in Table 2.

Table 2. Threatened flora, fauna and ecological communities recorded within the locality

| Scientific Name | Common Name | TSC Act | EPBC Act |
|--|----------------------------|---------|----------|
| Endangered Ecological Communities | | | |
| Littoral Rainforest and Coastal Vine Thickets of Eastern Australia | | - | CE |
| Lowland Rainforest of Subtropical Australia | | - | CE |
| Fauna | | | |
| <i>Anthochaera Phrygia</i> | Regent Honeyeater | CE | E |
| <i>Apus pacificus</i> | Fork-tailed Swift | - | M |
| <i>Ardea alba</i> | Gret Egret | - | M |
| <i>Ardea ibis</i> | Cattle Egret | - | M |
| <i>Botaurus poiciloptilus</i> | Australasian Bittern | E | E |
| <i>Calyptorhynchus lathami</i> | Glossy Black-Cockatoo | V | - |
| <i>Chalinolobus dwyeri</i> | Large-eared Pied Bat | V | V |
| <i>Crinia tinnula</i> | Wallum Froglet | V | - |
| <i>Daphoenositta chrysoptera</i> | Varied Sittella | V | - |
| <i>Dasyornis brachypterus</i> | Eastern Bristlebird | E | E |
| <i>Dasyurus maculatus maculatus</i> | Spotted-tail Quoll | V | E |
| <i>Ephippiorhynchus asiaticus</i> | Black-necked Stork | E | - |
| <i>Falsistrellus tasmaniensis</i> | Eastern False Pipistrelle | V | - |
| <i>Gallinago hardwickii</i> | Latham's Snipe | - | M |
| <i>Glossopsitta pusilla</i> | Little Lorikeet | V | - |
| <i>Haliaeetus leucogaster</i> | White-bellied Sea-Eagle | - | M |
| <i>Hieraetus morphnoides</i> | Little Eagle | V | - |
| <i>Hirundapus caudacutus</i> | White-throated Needletail | - | M |
| <i>Ixobrychus flavicollis</i> | Black Bittern | V | - |
| <i>Lathamus discolor</i> | Swift Parrot | E | E |
| <i>Litoria aurea</i> | Green and Golden Bell Frog | E | V |
| <i>Lophoictinia isura</i> | Square-tailed Kite | V | - |
| <i>Merops ornatus</i> | Rainbow Bee-eater | - | M |
| <i>Miniopterus australis</i> | Little Bentwing-bat | V | - |
| <i>Miniopterus schreibersii oceanensis</i> | Eastern Bentwing-bat | V | - |
| <i>Mixophyes balbus</i> | Stuttering Frog | E | V |
| <i>Monarcha melanopsis</i> | Black-faced Monarch | - | M |
| <i>Monarcha trivirgatus</i> | Spectacled Monarch | - | M |
| <i>Mormopterus norfolcensis</i> | Eastern Freetail-bat | V | - |
| <i>Myiagra cyanoleuca</i> | Satin Flycatcher | - | M |
| <i>Myotis macropus</i> | Southern Myotis | V | - |
| <i>Ninox connivens</i> | Barking Owl | V | - |
| <i>Ninox strenua</i> | Powerful Owl | V | - |
| <i>Pandion cristatus</i> | Eastern Osprey | V | - |
| <i>Petaurus australis</i> | Yellow-bellied Glider | V | - |

| | | | |
|---|-------------------------------|----|-----|
| <i>Petaurus norfolcensis</i> | Squirrel Glider | V | - |
| <i>Phascogale tapoatafa</i> | Brush-tailed Phascogale | V | - |
| <i>Phascolarctos cinereus</i> | Koala | V | V |
| <i>Potorous tridactylus tridactylus</i> | Long-nosed Potoroo | V | V |
| <i>Ptilinopus magnificus</i> | Wompoo Fruit-dove | V | - |
| <i>Pseudomys novaehollandiae</i> | New Holland Mouse | - | V |
| <i>Pseudomys oralis</i> | Hastings River Mouse | E | E |
| <i>Pteropus poliocephalus</i> | Grey-headed Flying-fox | V | V |
| <i>Rhipidura rufifrons</i> | Rufous Fantail | - | M |
| <i>Rostratula australis</i> | Australian Painted Snipe | E | E,M |
| <i>Saccolaimus flaviventris</i> | Yellow-bellied Sheathtail-bat | V | - |
| <i>Scoteanax rueppellii</i> | Greater Broad-nosed Bat | V | - |
| <i>Syconycteris australis</i> | Common Blossom-bat | V | - |
| <i>Tyto longimembris</i> | Eastern Grass Owl | V | - |
| <i>Tyto novaehollandiae</i> | Masked Owl | V | - |
| <i>Tyto tenebricosa</i> | Sooty Owl | V | - |
| Flora | | | |
| <i>Allocasuarina defungens</i> | Dwarf Heath Casuarina | E | E |
| <i>Allocasuarina simulans</i> | Nabiac Casuarina | V | V |
| <i>Asperula asthenes</i> | Trailing Woodruff | V | V |
| <i>Corunastylis littoralis</i> | Tuncurry Midge Orchid | CE | CE |
| <i>Cryptostylis hunteriana</i> | Leafless Tongue-orchid | V | V |
| <i>Cynanchum elegans</i> | White-flowered Wax | E | E |
| <i>Euphrasia arguta</i> | - | CE | CE |
| <i>Lindernia alsinoides</i> | Noah's False Chickweed | E | - |
| <i>Macadamia integrifolia</i> | Macadamia Nut | V | V |
| <i>Melaleuca biconvexa</i> | Biconvex Paperbark | V | V |
| <i>Phaius australis</i> | Lesser Swamp-orchid | E | E |
| <i>Senna acclinis</i> | - | E | - |
| <i>Streblus pendulinus</i> | Siah's Backbone | - | E |
| <i>Syzygium paniculatum</i> | Magenta Lilly Pilly | E | V |
| <i>Tetradlea juncea</i> | Black-eyed Susan | V | V |

Status: CE = Critically Endangered, E = Endangered, V = Vulnerable, M = Migratory.

Seven additional species not previously recorded within the locality have been included in the likelihood of occurrence analysis as the study area occurs within their natural range of distribution. These species are listed in Table 3.

Table 3. Additional threatened flora and fauna species that may occur within the locality

| Scientific Name | Common Name | TSC Act | EPBC Act |
|----------------------------------|----------------------------|---------|----------|
| Fauna | | | |
| <i>Aepyprymnus rufescens</i> | Rufous Bettong | V | - |
| <i>Burhinus gallarius</i> | Bush Stone-curlew | E | - |
| <i>Hoplocephalus bitorquatus</i> | Pale-headed Snake | V | - |
| <i>Hoplocephalus stephensii</i> | Stephens' Banded Snake | V | - |
| <i>Litoria brevipalmata</i> | Green-thighed Frog | V | - |
| <i>Pseudomys gracilicaudatus</i> | Eastern Chestnut Mouse | V | - |
| Flora | | | |
| <i>Rhizanthella slateri</i> | Eastern Underground Orchid | V | E |

Status: CE = Critically Endangered, E = Endangered, V = Vulnerable, M = Migratory.

3.2 Flora

A total of 31 flora species were recorded in the sole BioMetric plot completed during the survey. The tree canopy consisted of *Eucalyptus microcorys*, *E. propinqua*, *E. siderophloia*, *E. acmenoides* and *Corymbia intermedia*. The midstorey was dominated by *Allocasuarina torulosa* and *Lophostemon confertus* and the groundstorey was dominated by *Lomandra longifolia*, *Themeda australis* and *Imperata cylindrica* (Plate 1). A summary of the BioMetric data is included in Appendix 1.



Plate 1 Vegetation within the Road Alignment Area (note tape being used to undertake BioMetric Plot)

Observations from random meander surveys conducted outside the BioMetric plot and within the study area indicate some variability in native vegetation cover. The vegetation within the finished product stockpile extension area and the heavy vehicle access road footprint is comparatively sparse comprising a greater compliment of sclerophyllous species. The canopy layer of this area is dominated by *Corymbia maculata*, *E. propinqua* and *E. siderophloia*. Overall, the vegetation located within the areas to be cleared represents a single unit and, based on Hunter Biometric Vegetation Typing, this vegetation is classified as Small-fruited Grey Gum - Tallowwood shrubby open forest on coastal foothills of the southern North Coast (HU 620).

Threatened species

The two separate random meanders conducted throughout the study area to target threatened plants did not result in the detection of any threatened flora species.

3.2.1 Noxious Weeds

One noxious weed species, *Lantana camara*, listed on the NSW *Noxious Weeds Act 1992* (NW Act) was recorded within the study area. Lantana is listed as a Class 4 weed within the Greater Taree City Council and has the following regulatory direction:

“The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction and the plant must not be sold propagated or knowingly distributed” NSW DPI (2014).

3.3 Fauna

Threatened species

The Grey-headed Flying Fox (*Pteropus poliocephalus*) was the only threatened fauna species recorded on site. A migratory species listed under the EPBC Act was recorded, namely the Rufous Fantail (*Rhipidura rufifrons*). All species recorded during nocturnal surveys or opportunistically are listed in Table 4 below.

Table 4. Fauna species recorded within the study area

| Scientific Name | Common Name | TSC Act | EPBC Act |
|---------------------------------|----------------------------|---------|----------|
| <i>Cormobates leucophaea</i> | White-throated Treecreeper | - | - |
| <i>Corvus coronoides</i> | Australian Raven | - | - |
| <i>Litoria fallax</i> | Eastern Dwarf Tree Frog | - | - |
| <i>Litoria wilcoxii</i> | Stony-creek Frog | - | - |
| <i>Manorina melanocephala</i> | Noisy Minor | - | - |
| <i>Pardalotus punctatus</i> | Spotted Pardalote | - | - |
| <i>Petaurus breviceps</i> | Sugar Glider | - | - |
| <i>Philemon corniculatus</i> | Noisy Friarbird | - | - |
| <i>Pteropus poliocephalus</i> | Grey-headed Flying Fox | V | V |
| <i>Rhipidura rufifrons</i> | Rufous Fantail | - | M |
| <i>Trichoglossus haematodus</i> | Rainbow Lorikeet | - | - |
| <i>Vanellus miles</i> | Masked Lapwing | - | - |



Plate 2 *Litoria fallax* recorded within the proposed Heavy Vehicle Access Road Alignment Area

3.3.1 Fauna Habitat

The vegetation within the study area provides suitable foraging habitat for a range of species. Eucalypt and Corymbia species dominate the overstorey and provide food sources (foliage, nectar, pollen, exudates and invertebrates) for birds, bats and arboreal mammals. *Allocasuarina torulosa* is a preferred feed tree species for the threatened Glossy Black-cockatoo, but the trees located showed no signs of being used as feed trees (no cracked seed cones on the ground under the trees).

The varied ground layer provides habitat for small mammals, reptiles and woodland birds and is enhanced by woody debris and leaf litter. The high density of fallen logs provides plenty of hollows and fissures used for shelter by small mammals. Reptiles shelter underneath logs and in dense leaf litter. The relatively grassy ground layer supports grazing macropods and wombats.

Seven hollow-bearing trees, each having one hollow, were recorded during field surveys (Figure 4). Hollows ranged in size from small (< 10 centimetres) to medium (10 - 20 centimetre) and are suitable for a range of fauna species including microbats, possums, parrots and gliders. One large (> 30 centimetre) hollow suitable for forest owls was observed. Several trees had shallow scratches on the trunk, most likely from a possum species such as the Common Ringtail Possum (*Pseudocheirus peregrinus*) or Brush-tailed Possum (*Trichosurus vulpecula*), that would provide prey items for owl species such as the Powerful Owl (*Ninox strenua*).

3.3.2 Koala Habitat

The SAT plot undertaken within the proposed heavy vehicle access road alignment area indicated no potential Koala habitat as the density of *Eucalyptus microcorys* was below 15%. The SAT plot undertaken within the proposed finished product stockpile extension area showed a density of approximately 46% of *E. microcorys* and thus is potential Koala habitat.

No Koala scats were found during the SAT surveys and no deep scratching indicative of koalas was observed on suitable trees. Spotlighting and call playback did not result in the detection of any free ranging Koalas within the study area.

4. Impact Analysis

4.1 Project Impacts

4.1.1 Direct Impacts – Habitat Loss

A total of 1.284 hectares of native vegetation is proposed to be cleared as part of the development. The vegetation to be cleared is on the edge of currently cleared lands or essentially surrounded by cleared grounds within the quarry boundary. The vegetation to be cleared does not form part of an EEC and does not contain known critical foraging habitat for any threatened species. It does not contain significant rock outcrops or pools/ponds/streams that may form important shelter or breeding sites.

The impact area does contain seven hollow-bearing trees that would be removed as part of the increased footprint and these need to be considered as part of any assessment prepared under Section 5A of the *Environmental Planning and Assessment Act 1979* (i.e. Seven Part Tests of Significance). Hollow-bearing trees contain shelter and/or nesting habitat for nocturnal and diurnal birds, bats, some reptiles and frogs. The impacts of the removal of hollow-bearing trees would be mitigated through site specific management actions as outlined in Section 4.2.5.

4.1.2 Connectivity and Edge Effects

No change in vegetation connectivity is expected as a consequence of the proposal due to the small amount of clearing required compared with the extent of connectivity of the surrounding connected native vegetation cover. Nor is there any expectation of habitat fragmentation given the likely small area to be removed and its location within or proximity to the current operational quarry site.

Similarly, loss of vegetation may have an impact through increasing the area of “edge” where native vegetation adjoins cleared lands. Edge vegetation is more impacted by wind and has more sunlight penetration, changing its characteristics compared to intact native vegetation. New areas will be subjected to edge effects, but there is already an edge as a result of the current quarry boundary and the edge would not increase significantly along the line of the new access road. The vegetation to be removed from the expanded stockpile area is already isolated. Hence there should be no significant increase in overall edge effects and such effects are managed through the Jandra Quarry Draft Environmental Management Plan.

4.1.3 Intensification

The proposed intensification in production will result in the following changes and potential impacts:

- a) **Vehicle Movements:** There will be an increase in the number of vehicle movements and therefore the regularity of noise. The vehicle noise volumes will remain the same as the same types of vehicles will use the internal haul roads and the main access road during intensified operations. Given the speed of the vehicles using the road is low, road-kill is not expected to increase significantly. The extension of operating hours into the night (6am - 10pm Monday to Friday) compared to current levels (6am - 6pm Monday to Friday) will expose nocturnal species to noise.
- b) **Machinery Operations:** The operating hours of machinery will increase by approximately 25%, extending into the night through all seasons of the year and exposing nocturnal species to increased levels of noise and light. However, it is noted that there is already a small level of nightly activity during the winter months and that the quarry has been in operation since 1986 and hence the local fauna has been subject to quarry noise for an extended period of time. There will also be a daily increase in dust emissions from the site, although the emissions have been determined well within the human air quality assessment criteria (see specialist report on air quality).

Based on the above observations, there is unlikely to be any significant increase in road-kills and the operational noise will also not change in a significant way. Consideration, however, needs to be given to the potential for increased levels of dust and extended timing of noise and light, particularly into the night.

The literature review on the impacts of these actions on fauna and flora (Section 3.1.1) has indicated that increased periods of anthropogenic noise do have the potential to alter the behaviour of birds and frogs in Australia. However, this is not known to have sufficient impacts such as to cause population declines. Further, the main impact results where species attempt to change their calling behaviour to avoid competition with the interfering noise, either by changing the frequency of calling or restricting calling to periods with reduced or no noise. At the highest level of production, the quarry will be expected to generate a truck movement every five minutes between 6am and 10pm, with truck movements from 6pm to 10pm likely to reduce significantly. This leaves the majority of time available for unimpeded communications by fauna and so it is expected that calling species will have sufficient time to undertake normal activities and not be negatively impacted by an increase in the regularity of traffic noise. The increased hours of material extraction and processing will affect areas currently subjected to noise and would not impact further on diurnal species. There will be an increase in the night-time noise with the extension of activities from 6:00PM to 10:00PM. However, as there is unlikely to be a significant change in the noise levels, the proposed intensification in production including the extension of operating hours is not expected then to have a negative impact on species occupying the site and surrounds. Finally, the area to be affected forms only a small percentage of the available habitat within the locality leaving the majority of habitat unaffected and therefore species should not be significantly impacted.

Increased levels of artificial light have been found to often have a potential or real negative impact on fauna, but this does vary depending on the species. Increased levels of artificial light will occur due to the extension of operating hours after dark, although this will vary dependent on time of year. There is no breeding habitat available in the study area for relevant threatened frogs (requiring temporary pools or streams) and therefore the proposed intensification in production is should not impact any threatened frogs. The nocturnal birds under consideration are owls which are visual predators and so are likely to be unimpeded by additional periods of artificial light, as they use light to hunt. Mammalian prey may reduce activity, dependent on their method of foraging and so could reduce the availability of prey to owls in some instances. Notably the Grey-headed Flying Fox is known to consistently use lit urban areas and so is unlikely to be impacted by increased artificial light. The overall impact of the proposed intensification in production is, however, unlikely to result in significant negative impacts on fauna as the area to be affected by increased levels of artificial light forms only a small percentage of the available habitat within the locality, leaving the majority of habitat unaffected by light while all areas will still remain unlit during the majority of the night hours. Further, the bushland adjacent to the existing quarry operations is already affected by lighting and activity, albeit for lesser times. Therefore it is considered unlikely that increased hours of artificial lighting would lead to significant impacts on any species.

Based on a review of available literature (refer Section 3.1.1), the potential impacts of dust on biodiversity at the site are unclear. Notwithstanding, the area of habitat at the quarry site that is potentially affected forms only a very small proportion of the available habitat within the locality while the majority of habitat (in the locality) will remain unaffected. It should be noted that the Air Quality Impact Assessment prepared for the Project predicted that all particulate matter emissions from the proposed intensified operations would meet all EPA assessment criteria at the closest receivers. With the implementation of the proposed dust controls outlined in the Air Quality Impact Assessment, it is unlikely that the intensified operations would result in greater impacts on the surrounding biophysical environment and associated species than the existing approved operations.

4.2 Affected Threatened Biodiversity

4.2.1 Ecological Communities

No listed EECs were recorded within the study area and therefore the proposal would be unlikely to have a significant impact on any EEC.

4.2.2 Flora

No threatened flora species have been previously recorded within the study area (ERM 1999, Umwelt 2011) or during the recent surveys. However habitat potentially suitable for two threatened species has been identified (Table 5).

Table 5. Potentially affected threatened flora species

| Scientific Name | Common name | TSC Act | EPBC Act | Likelihood of occurrence |
|--------------------------------|----------------------------|---------|----------|--------------------------|
| <i>Cryptostylis hunteriana</i> | Leafless Tongue-orchid | V | V | Low |
| <i>Rhizanthella slateri</i> | Eastern Underground Orchid | V | E | Moderate |

In the case of the Leafless Tongue-orchid, the two inspections of the site were undertaken at appropriate times to locate this species and it was not detected. It is therefore concluded that it is not present and so the species does not require impact assessment. The surveys, however, were not appropriately timed for the Eastern Underground Orchid, which flowers only between September and November and therefore its presence or absence cannot be properly assessed. The Eastern Underground Orchid is currently known from fewer than 10 locations, but has been recorded less than 40 km away in the Bulahdelah area and given the suitable habitat on site, it has the potential to be present. If present, any impact could be considered to be significant based on the very few known locations for the species and so very small population size. A seasonal survey for this species will be undertaken prior to commencement of clearing (Section 4.2.5).

Based on discussions with OEH in a phone conversation on the 26th of June 2014, it was determined that a (Section 5a) seven part test and EPBC assessment should be undertaken for the Eastern Underground Orchid with it being presumed to present in the impact area (Appendix 2). The assessments both concluded that there is likely to be a significant impact on the Eastern Underground Orchid. A springtime survey will be conducted to establish if the Eastern Underground Orchid is present in the study area. The impact assessments will then be reviewed and recommendations made for mitigation, if required.

4.2.3 Fauna

The EPBC and TSC listed Grey-headed Flying Fox along with the EPBC migratory listed Rufous Fantail were detected in the recent surveys and an additional 20 threatened fauna have been identified as previously known from, or having sufficiently suitable habitat within the study area, to have a moderate or higher likelihood of occurrence (Table 6).

Table 6. Threatened fauna species with a moderate or higher likelihood of occurrence in the study area

| Scientific Name | Common name | TSC Act | EPBC Act | Likelihood of occurrence |
|----------------------------------|-----------------------|---------|----------|--------------------------|
| <i>Aepyprymnus rufescens</i> | Rufous Bettong | V | - | Moderate |
| <i>Calyptorhynchus lathami</i> | Glossy Black-Cockatoo | V | - | Moderate |
| <i>Chalinolobus dwyeri</i> | Large-eared Pied Bat | V | V | Moderate |
| <i>Daphoenositta chrysoptera</i> | Varied Sittella | V | - | Moderate |

| Scientific Name | Common name | TSC Act | EPBC Act | Likelihood of occurrence |
|--|--------------------------------|---------|----------|--------------------------|
| <i>Dasyurus maculatus maculatus</i> | Spotted-tailed Quoll | V | E | High |
| <i>Falsistrellus tasmaniensis</i> | Eastern False Pipistrelle | V | - | Known |
| <i>Glossopsitta pusilla</i> | Little Lorikeet | V | - | High |
| <i>Hoplocephalus stephensii</i> | Stephens' Banded Snake | V | - | Moderate |
| <i>Lophoictinia isura</i> | Square-tailed Kite | V | - | Moderate |
| <i>Miniopterus australis</i> | Little Bentwing-bat | V | - | High |
| <i>Miniopterus schreibersii oceanensis</i> | Eastern Bentwing-bat | V | - | High |
| <i>Mormopterus norfolkensis</i> | Eastern Freetail-bat | V | - | Known |
| <i>Ninox strenua</i> | Powerful Owl | V | - | High |
| <i>Petaurus australis</i> | Yellow-bellied Glider | V | - | Moderate |
| <i>Petaurus norfolcensis</i> | Squirrel Glider | V | - | Moderate |
| <i>Phascogale tapoatafa</i> | Brush-tailed Phascogale | V | - | High |
| <i>Phascolarctos cinereus</i> | Koala | V | V | Known |
| <i>Pteropus poliocephalus</i> | Grey-headed Flying-fox | V | V | Known |
| <i>Saccolaimus flaviventris</i> | Yellow-bellied Sheath-tail-bat | V | - | Moderate |
| <i>Scoteanax rueppellii</i> | Greater Broad-nosed Bat | V | - | High |
| <i>Tyto novaehollandiae</i> | Masked Owl | V | - | High |
| <i>Tyto tenebricosa</i> | Sooty Owl | V | - | Moderate |

Seven part tests and EPBC assessments carried out for these 22 species concluded there will be no significant impacts on any threatened fauna as a result of the proposed project (Appendix 2). This is based on the relatively small area to be disturbed, the location of the vegetation to be cleared and the presence of large areas of similar though undisturbed vegetation surrounding the study area,

4.2.4 Core Koala Habitat

The proposal does not require a Koala Plan of Management prepared in accordance with SEPP 44. No Koalas or Koala faecal pellets were observed within the study area and only a limited number of Koala records exist within the region. While potential Koala habitat has been identified within the study area, it is considered that the study area does not contain core Koala habitat as there is no evidence of koala breeding activity or even any form of resident population. .

4.2.5 Mitigation measures

However, the following mitigation measures are proposed to minimise any impacts of the proposed actions on resident fauna and flora for the proposed works to create a new heavy vehicle access road, expansion of the finished product stockpile area and increase in hours of operation:

- Undertake a two-stage tree removal process. This will involve the clearing of understorey and all non-hollow bearing trees to leave hollow-bearing trees remaining isolated for a single night. This will encourage any fauna using the trees to vacate the tree and move to an alternative den sites. The hollow-bearing tree will then be removed the following day with an ecologist or wildlife carer qualified to handle fauna (including micro-bats) in attendance to rescue any injured fauna. That person should have a minimum of two years experience in fauna handling including demonstrated experience in handling all of the likely types of species present (mammals and reptiles) and have

Lyssavirus vaccinations. The preferred timing for this action is outside of winter, when species are hibernating. This action will apply to actions undertaken for the proposed works assessed in this FFIA.

- The inclusion of nesting boxes, at a ratio of 2:1 for every hollow removed and maintained for five years post clearance. The nest boxes will need to match the size of the hollows removed. This will compensate for the loss of these hollows and so maintain the density of available hollows. The nest boxes to be installed will include boxes designed to meet the requirements of hollow dependent birds, mammals and bats.
- Undertake a targeted spring survey for the Eastern Underground Orchid prior to commencement of any clearing to assess the presence or absence of this species. Should this species be detected, the proponent will:
 - liaise with the relevant authorities regarding mitigation and management of impacts; and
 - give consideration to the preparation of a Referral to DotE in accordance with the EPBC Act.
- The implementation of vegetation management as per the Jandra Quarry Draft Environmental Management Plan that was completed as part of the 2000 consent. The continued implementation of this plan will reduce the impacts of weeds during and immediately after the construction phase of the new heavy vehicle access road and expansion of the finished product stockpile area. This is when ground disturbance has the potential to create conditions conducive to weed establishment in adjacent areas. It will lead to the reduction in edge effects and the maintenance of better quality habitat adjacent to all quarry areas, improving the habitat for resident native fauna and flora.

5. Conclusion

No EECs are located within the study area. The proposed development will therefore not impact on listed EECs.

Habitat potentially suitable for two threatened species of orchid has been identified within the study area. Two separate seasonal surveys undertaken for the Leafless Tongue orchid resulted in non-detection and the species was removed from further consideration. Survey timing was not appropriate for the Eastern Underground Orchid. The likelihood of the latter flora species occurring within the study area is considered moderate as the habitat is suitable and populations are known from within 40 kilometres. Assessments under the EPA Act and EPBC Act both concluded a significant impact is likely on this species if it is present in the impact area. Springtime surveys are to be undertaken to confirm its presence or absence, allow a more detailed assessments of the impacts of this development and develop suitable mitigation, if required.

The EPBC and TSC listed Grey-headed Flying Fox as well as the EPBC migratory listed Rufous fantail were recorded within the study area. An additional 20 threatened fauna have been identified as previously known from or having potentially suitable habitat within the study area. Due to the small disturbance footprint of the proposed new infrastructure, the location of new infrastructure on previously disturbed areas, as well as the presence of large tracts of similar, less disturbed vegetation in the surrounding area, it is unlikely that the proposed modification will result in significant impacts on threatened fauna. Similarly, the intensification in production will impact only a small area of available habitat surrounding the operational quarry and be restricted to already impacted areas of habitat and so the proposed intensification in production, resulting in longer periods of artificial lighting, noise and dust emissions, is unlikely to result in significant impacts on threatened fauna or flora.

The study area does not contain core Koala habitat that will need further consideration either through a Referral under the *Environmental Protection and Biodiversity Conservation Act 1999* or through the development of a Koala Plan of Management.

Mitigation measures proposed are:

- Standard two-stage tree clearing procedures to allow any hollow-dwelling fauna to leave trees prior to any clearing;
- The inclusion of a variety of nesting boxes to match removed hollows, at a ratio of 2:1 for every hollow removed, maintained for five years post clearance;
- Undertaking targeted spring surveys for the Eastern Underground Orchid to confirm its presence or absence in the impact area and so accurately assess the impacts of the development on this species.

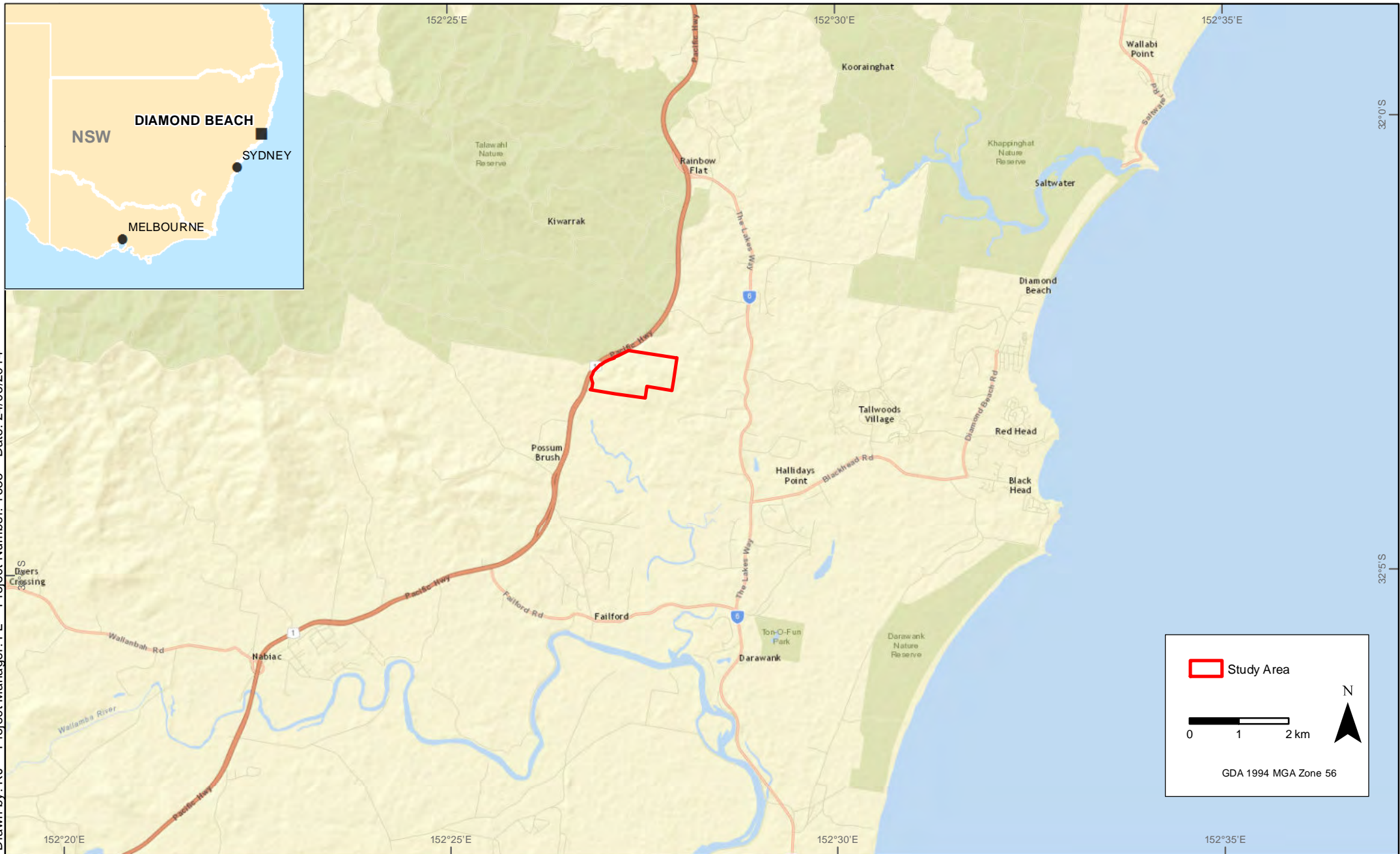
6. References

- Baker, B. J. and Richardson, J. M. L. (2006). The effect of light on male reproductive behaviour in green frogs, *Rana clamitans*. *Canadian Journal of Zoology* 84: 1528-1532.
- CSR Readymix (2002). Jandra Quarry Statement of Environmental Effects for Enlargement of an Overburden Emplacement Area. North Coast Forestry & Ecology Services, Kendall, NSW.
- DEC (2004). Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft). New South Wales Department of Environment and Conservation, Hurstville, NSW.
- DOE (2013). SPRAT database <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl> (Accessed February 2014). Commonwealth of Australia, Canberra.
- DOE (2014). Protected Matters Search for the Jandra Quarry locality, Possum Brush. <http://www.environment.gov.au/epbc/pmst/index.html>.
- Dominoni, D.M., Quetting, M. and Partecke, J. (2013). Long-term effects of chronic light pollution on seasonal functions of European blackbirds (*Turdus merula*). *PLoS ONE* 8(12): e85069. doi:10.1371/journal.pone.0085069.
- Dominoni, D. M., Carmona-Wagner, E. O., Hofmann, M., Kranstauber, B., Partecke, J. (2014). Individual-based measurements of light intensity provide new insights into the effects of artificial light at night on daily rhythms of urban-dwelling songbirds. *Journal of Animal Ecology* 83: 681–692.
- ERM (1999). Jandra Quarry Extension Environmental Impact Statement. CSR Construction Materials.
- Farmer, A. M. (1993). The effects of dust on vegetation: A review. *Environmental Pollution* 79: 63-75
- Gibbons P., Ayers D., Seddon J., Doyle S. and Briggs S. (2005). BioMetric, A terrestrial biodiversity assessment tool for the NSW Property Vegetation Plan Developer, Operational manual. Version 1.8. NSW Department of Environment and Conservation, c/- CSIRO Sustainable Ecosystems, Canberra.
- Kavanagh R.P. and Peake, P. (1993). Distribution and habitats of nocturnal forest birds in south eastern New South Wales. In: Olsen, P. (ed.). *Australian Raptor Studies*. Australasian Raptor Association, Royal Australasian Ornithologists Union, Melbourne. Pp. 101-125.
- Lewanzik, D. and Voigt, C. C. (2014). Artificial light puts ecosystem services of frugivorous bats at risk. *Journal of Applied Ecology* 51: 388–394.
- McGowan, C. P. and Simons, T. R. (2006). Effects of human recreation on the incubation behavior of American Oystercatchers. *The Wilson Journal of Ornithology* 118: 485-493.
- NSW DPI (2014). Noxious Weeds Declarations for Greater Taree City Council. Accessed February 2014. http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/noxweed/noxious-app-application?sq_content_src=%252BdXJsPWh0dHAIM0EIMkYIMkZ3ZWVkcY5kcGkubnN3Lmdvdi5hdSUyRndlZWRzUHVibGljJTJGQ291bmNpbCUyRkRldGFpbHMmYWxsPTE%253D&id=48&search=go

- OEH (2012). Vegetation Types Database (updated May 2012).
<http://www.environment.nsw.gov.au/biobanking/vegtypedatabase.htm>
- OEH (2014a). Threatened Species Profiles for threatened species, endangered populations and endangered ecological communities listed under the NSW Threatened Species Conservation Act 1999. New South Wales Office of Environment and Heritage. Sydney, Australia, 2005. Online profiles found at http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_species.asp (accessed February 2014).
- OEH (2014b). Wildlife Atlas Database Search for the Jandra Quarry locality, Possum Brush.
<http://www.bionet.nsw.gov.au/>
- Parris, K. M., and Schneider, A. (2008). Impacts of traffic noise and traffic volume on birds of roadside habitats. *Ecology and Society* 14: 29.
- Parris, K. M., Velik-Lord, M. and North, J. M. A, (2009). Frogs call at a higher pitch in traffic noise. *Ecology and Society* 14: 25.
- Phillips, S. and Callaghan, J. (1995). The Spot Assessment Technique for determining the significance of habitat utilisation by Koalas. Addendum to Proceedings of a conference on the status of the Koala in 1995. Australian Koala Foundation, Brisbane, Australia.
- Prugh, L. R. and Golden, C. D. (2014). Does moonlight increase predation risk? Meta-analysis reveals divergent responses of nocturnal mammals to lunar cycles. *Journal of Animal Ecology* 83: 504–514.
- Umwelt (2011). Jandra Quarry Clarification of Production and Transportation Limits Environmental Assessment. Holcim (Australia) Pty Ltd.

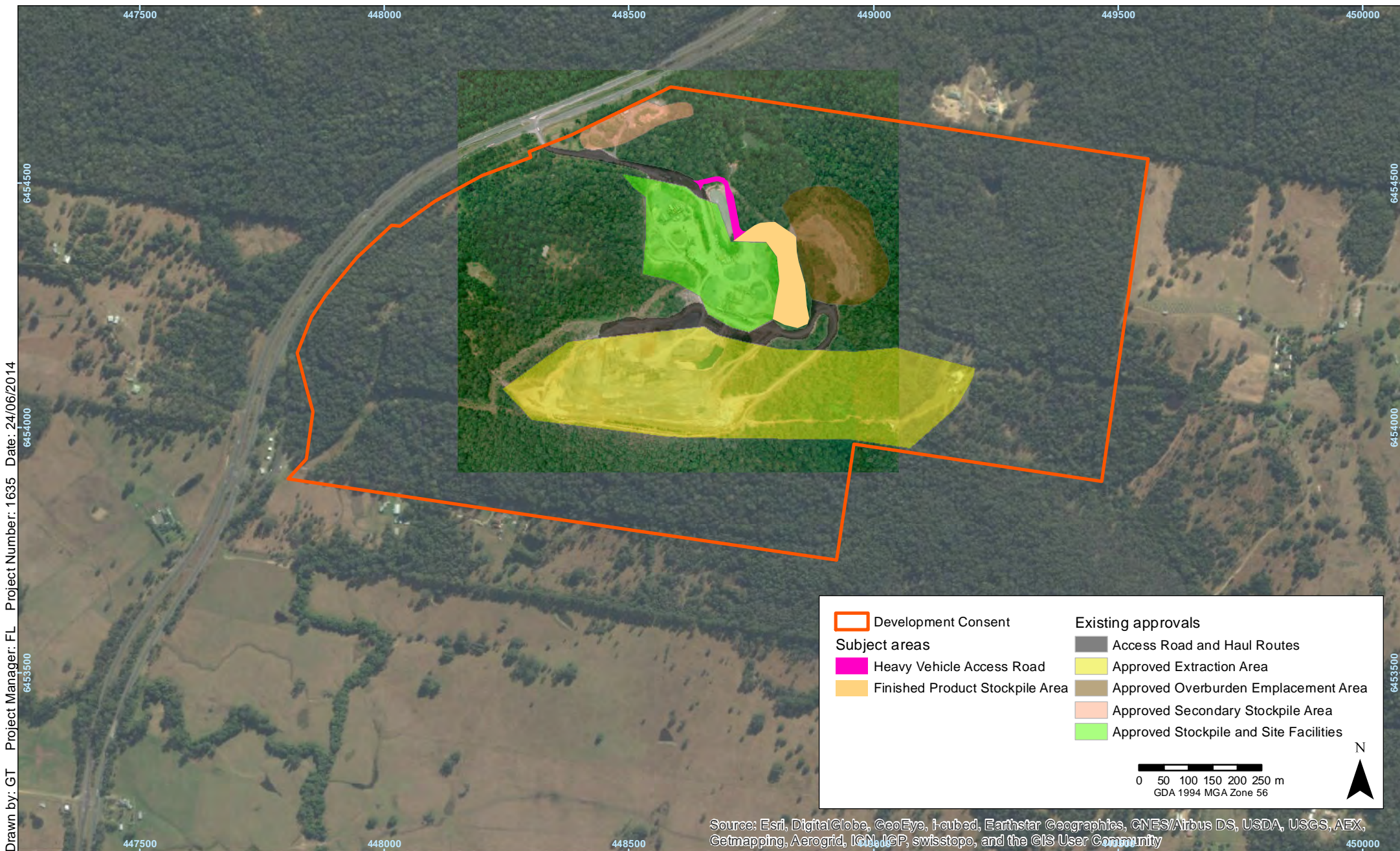
Figures

Drawn by: R.J Project Manager: FL Project Number: 1635 Date: 24/06/2014



Regional Project Location
Jandra Quarry Flora and Fauna Assessment

FIGURE 1



Site Map

Jandra Quarry Flora and Fauna Assessment

FIGURE 2



Survey Area
Jandra Quarry Flora and Fauna Constraints Assessment

FIGURE 3



Source: Esri, DigitalGlobe, GeoEye, Icube, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGR, swisstopo, and the GIS User Community

Study Area

Survey Sites

- BioMetric plot
- Call play-back
- Koala SAT1
- Koala SAT2
- * Hollow-bearing trees

Existing approvals

- Access Road and Haul Routes
- Approved Extraction Area
- Approved Overburden Emplacement Area
- Approved Secondary Stockpile Area
- Approved Stockpile and Site Facilities

0 50 100 m
GDA 1994 MGA Zone 56

N

Survey Effort

Jandra Quarry Flora and Fauna Assessment

FIGURE 4

Appendices

Appendix 1: Flora List

| Family | Scientific Name | Common Name | Plot | Random meander |
|------------------|----------------------------------|-------------------------|------|----------------|
| Casuarinaceae | <i>Allocasuarina torulosa</i> | Forest Oak | ✓ | |
| Fabaceae | <i>Acacia maidenii</i> | Maiden's Wattle | ✓ | |
| Myrtaceae | <i>Callistemon salignus</i> | Willow Bottlebrush | ✓ | |
| Blechnaceae | <i>Blechnum cartilagineum</i> | Gristle Fern | ✓ | |
| Phyllanthaceae | <i>Breynia oblongifolia</i> | Coffee Bush | ✓ | |
| Ranunculaceae | <i>Clematis aristata</i> | Old Man's Beard | ✓ | |
| Asteliaceae | <i>Cordyline stricta</i> | Narrow-leaved Palm lily | ✓ | |
| Myrtaceae | <i>Corymbia intermedia</i> | Pink Bloodwood | ✓ | |
| Myrtaceae | <i>Corymbia maculata</i> | Spotted Gum | | ✓ |
| Fabaceae | <i>Desmodium varians</i> | Slender Tick-trefoil | ✓ | |
| Phormiaceae | <i>Dianella caerulea</i> | Blue Flax-lily | ✓ | |
| Orchidaceae | <i>Dipodium variegatum</i> | - | ✓ | |
| Myrtaceae | <i>Eucalyptus acmenoides</i> | White Mahogany | ✓ | |
| Myrtaceae | <i>Eucalyptus microcorys</i> | Tallowwood | ✓ | |
| Myrtaceae | <i>Eucalyptus propinqua</i> | Small-fruited Grey Gum | ✓ | |
| Myrtaceae | <i>Eucalyptus saligna</i> | Sydney Blue Gum | | ✓ |
| Myrtaceae | <i>Eucalyptus siderophloia</i> | Grey Ironbark | ✓ | |
| Luzuriagaceae | <i>Eustrephus latifolius</i> | Wombat Berry | ✓ | |
| Luzuriagaceae | <i>Geitonoplesium cymosum</i> | Scrambling Lily | ✓ | |
| Phyllanthaceae | <i>Glochidion ferdinandi</i> | Cheese Tree | | ✓ |
| Fabaceae | <i>Glycine clandestina</i> | - | ✓ | |
| Poaceae | <i>Imperata cylindrica</i> | Blady Grass | ✓ | |
| Verbenaceae | <i>Lantana camara</i> * | Lantana | ✓ | |
| Ericaceae | <i>Leucopogon juniperinus</i> | Prickly Beard-heath | ✓ | |
| Arecaceae | <i>Livistona australis</i> | Cabbage Tree Palm | | ✓ |
| Lomandraceae | <i>Lomandra longifolia</i> | Spiny-headed Mat-rush | ✓ | |
| Myrtaceae | <i>Lophostemon confertus</i> | Brush Box | ✓ | |
| Poaceae | <i>Microlaena stipoides</i> | Weeping Grass | | ✓ |
| Bignoniaceae | <i>Pandorea pandorana</i> | Wonga Wonga Vine | ✓ | |
| Proteaceae | <i>Persoonia linearis</i> | Narrow-leaved Geebung | ✓ | |
| Pittosporaceae | <i>Pittosporum undulatum</i> | Sweet Pittosporum | | ✓ |
| Acanthaceae | <i>Pseuderanthemum variabile</i> | Pastel Flower | ✓ | |
| Dennstaedtiaceae | <i>Pteridium esculentum</i> | Bracken | ✓ | |
| Rosaceae | <i>Rubus parvifolius</i> | Native Raspberry | | ✓ |
| Smilacaceae | <i>Smilax australis</i> | Lawyer Vine | ✓ | |
| Solanaceae | <i>Solanum pungetium</i> | Eastern Nightshade | | ✓ |
| Menispermaceae | <i>Stephania japonica</i> | Snake Vine | ✓ | |
| Myrtaceae | <i>Syncarpia glomulifera</i> | Turpentine | ✓ | |
| Poacea | <i>Themeda australis</i> | Kangaroo Grass | ✓ | |

Appendix 2: Impact Assessments

Seven Part Tests of Significance for species with a moderate or greater likelihood of occurrence within the study area

Definitions

The following definitions have been extracted from the *Threatened Species Assessment Guidelines: The assessment of significance* (DECC 2007) and are relevant to this assessment:

Subject site: means the area directly affected by the proposal. The proposal will result in the direct impact to approximately 1.034ha of dry sclerophyll forest for a new stockpile area and 0.25ha of dry sclerophyll forest for the construction of a new access road. Thus the overall direct impact area is 1.284 ha.

Study area: means the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area includes the existing quarry and surrounding habitats, as defined in Figure 3.

Direct impacts: are those that directly affect the habitat and individuals. They include, but are not limited to, death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat. When applying each factor, consideration must be given to all of the likely direct impacts of the proposed activity or development. Approximately 1.284 ha of Shrubby Grey Gum forest (referred to as dry sclerophyll forest) would be directly impacted by the proposal through clearing.

Indirect impacts: Indirect impacts can include loss of individuals through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious hydrological changes, increased soil salinity, erosion, inhibition of nitrogen fixation, weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas. As with direct impacts, consideration must be given, when applying each factor, to all of the likely indirect impacts of the proposed activity or development. Indirect impacts associated within the proposal potentially include edge effects, erosion and weed invasion, although these are all currently operating on the site. The indirect impacts would be managed through the implementation of the mitigation measures discussed below.

Local occurrence: the ecological community that occurs within the study area. However, the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated. For the purposes of this assessment, the local occurrence of habitat is considered to be 5km from the subject site. Mid north coast vegetation mapping completed by Ecological Australia identified the occurrence of 4500 ha of vegetation within a 5km radius of the subject site, of which over 3500 ha is commensurate habitat (i.e. dry sclerophyll forest) to the subject site.

Locality: The locality is that area within a 5 km radius of the subject site (from interpretation of NPWS 1999).

Mitigation measures: these include the undertaking of a 2-stage tree clearing process, inclusion of nesting boxes at a ratio of 2:1 for every hollow removed and to be maintained for five years post clearance and the ongoing implementation of the Environmental Management Plan (2000) for management of remnant bushland surrounding the subject site.

| Threatened Raptors (Little Eagle, Eastern Osprey, Square-tailed Kite) | |
|--|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| Background | <p>The Little Eagle is listed as vulnerable under the TSC Act and is a medium-sized bird of prey. It is found throughout most of Australia and relies on habitat that supports a relatively high density of terrestrial mammals or small birds. It nests in tall trees, where it constructs a stick nest. The species occurs throughout the the woodlands to the west of the divide and formerly relied heavily on rabbits in its diet, however with the introduction of calicivirus in the mid 1990s, rabbit numbers have declined, thus having an effect on the abundance of the Little Eagle. However the main threat to the Little Eagle is the clearing and degradation of foraging and breeding habitat, with declines of up to 40% being observed over three generations, resulting in this species being recently listed as Vulnerable under the TSC Act.</p> <p>The Square-tailed Kite typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by <i>Eucalyptus longifolia</i>, <i>Corymbia maculata</i>, <i>Eucalyptus elata</i> or <i>E. smithii</i>. Individuals appear to occupy large hunting ranges of more than 100km². They require large living trees for breeding, particularly near water with surrounding woodland -forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.</p> <p>Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Ospreys will also roost within forested habitat up to 2km from water courses. .</p> <p>None of these species were recorded during the field surveys, however suitable habitat occurs which may, on occasion be used by these species.</p> |
| 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 | <p>The proposal will result in the removal approximately 1.284 hectares of potential foraging habitat for these species. However due to the occurrence of several thousand hectares of commensurate habitat within the locality, the removal is considered to be insignificant. The proposed intensification of activities will lead to increased night-time noise, dust and light levels, however the area of habitat to be impacted is again negligible compared the available habitat overall and so the action should not significantly impact on these raptors.</p> <p>It is therefore concluded that the proposal is unlikely to result in an adverse effect on the life cycle of the Little Eagle, Square-tail Kite and Eastern Osprey, such that, a viable local population of the species is likely to be placed at risk of extinction.</p> |
| 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 | N/A |
| c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: <ul style="list-style-type: none"> i. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or ii. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction | N/A |
| d) In relation to the habitat of a threatened species, population or ecological | Approximately 1.284 ha of habitat is proposed to be removed. |

| Threatened Raptors (Little Eagle, Eastern Osprey, Square-tailed Kite) | |
|--|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| <p>community:</p> <p>i. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and</p> <p>ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and</p> <p>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.</p> | <p>While the proposal will result in fragmentation of habitat via the construction of a new access track, due to being highly mobile species that can fly over cleared areas, the level of fragmentation is considered to be non significant.</p> <p>The habitat proposed for removal is not considered to be important for the long term survival of the Little Eagle, Eastern Osprey or Square-tailed Kite due to being commensurate with a large proportion of the surrounding landscape. No breeding trees were observed within the study area.</p> <p>The increased intensification of activities with the associated increase in light and noise is not expected to impact on the habitat of these species.</p> |
| e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly) | Under the TSC Act, the Director-General maintains a Register of critical habitat. To date, no critical habitat has been declared for the Little Eagle, Square-tailed Kite and Eastern Osprey. |
| f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or TAP | <p>As of the 30th of May 2014, no recovery plan has been prepared for the Little Eagle, Square-tailed Kite or Eastern Osprey. The following priority action statements have been identified for these species:</p> <ul style="list-style-type: none"> • Protect nest sites (usually large dead trees) and surrounding vegetation using appropriate buffer zones (suggest 100 metres). Preservation of the existing nest and structure is a priority and relocation should only be considered a last resort. • Work with managers of infrastructure to manage or translocate nests if site selection puts Osprey at risk. • Identify and protect regular feeding areas, perch (feeding) trees and nest material collection sites, particularly vegetation surrounding nest tree. • Consider direct and indirect impacts on the species and its habitat in planning processes including adequate field survey to identify nest tree, buffer protection zone, perch trees and feeding areas. Nesting season is from June to October. • Continue programs monitoring the breeding status of the species in NSW incorporating surveys of the number of active nest trees, breeding success at nests and protection of buffer zones and roost trees. • Undertake community awareness initiatives such as media campaigns, brochures and interpretive signs. These should cover issues such as the threat of discarding fish with fishing tackle attached, protection of potential and future nest trees. • Investigate the effectiveness of ameliorative management actions on the species including effectiveness of artificial nest structures. • Continue ecological research to determine whether availability of potential nest trees and/or food resources are limiting to the species as well as potential impacts of pesticides and pollutants on species breeding success. • Continue to consult with Aboriginal communities to determine cultural significance of the osprey. • Ensure implementation of management strategies that reduce disturbance of riparian areas. • Identify and protect nest trees, and monitor reproduction. • Liaise with local field ornithologist to obtain data on the Square-tailed Kite in the area. • Raise awareness non-target poisoning from baits. • Liaise with planning authorities to minimise the loss of habitat by clearing and fragmentation associated with urban and rural development. • Raise awareness of loss of habitat through population pressure. • Raise awareness about microhabitats used by Little Eagle. Encourage habitat retention through PVP process. <p>However none of the above threatened species recovery actions relate directly to this proposal.</p> |
| g) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP | <p>There are 37 terrestrial KTPs currently listed.</p> <p>The proposal may potentially constitute or promote the following listed KTP under the NSW TSC Act, relevant to the species being assessed:</p> <ul style="list-style-type: none"> • Clearing of native vegetation • Loss of hollow-bearing trees; <p>The proposal will incrementally contribute to the increased operation of the above KTPs.</p> |
| Conclusion: The proposed action is unlikely to have a significant impact on the Little Eagle, Eastern Osprey or Square-tail Kite due to the removal | |

| Threatened Raptors (Little Eagle, Eastern Osprey, Square-tailed Kite) | |
|--|---------------------|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| of a minimal amount (1.284 hectares) of potential foraging habitat and the increased intensification will also affect only a minimal area of already affected habitat. Therefore a Species Impact Statement is not required. | |

| Large Forest Owls (Powerful Owl, Sooty Owl and Masked Owl) | |
|--|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| Background | <p>Powerful Owls <i>Ninox strenua</i> are listed as vulnerable under the TSC Act and are the largest of Australia's owls and, accordingly, require a large amount of land for foraging. As stated in the recovery plan for large forest owls, the home range of this species can be from 300 to 1500 hectares. The size of the range is likely to be dependent on prey density. The most common food source is arboreal mammals; however the prey may depend on local availability and the preferences of a particular pair of owls.</p> <p>The proposed development would result in the removal or modification of up to 5 hectares of potential foraging habitat for this species. This equates to between 0.3% and 5% of the home range requirements. Removal or modification of habitat at this scale is unlikely to disrupt the foraging aspects of this species life cycle.</p> <p>The breeding roost, essentially several different trees, is used for many months of the year. Before nesting, a pair may be seen on one of their roost sites between 10-20m apart from one another, the female will then move into the nesting hollow alone and the male take up roost nearby (generally within a 50m radius of the nest but can be much more).</p> <p>Masked Owl inhabits a diverse range of dry eucalypt forest and woodland, especially adjacent to grassland or clearings. Typical home range has been estimated at 1122 to 1178 hectares. Key roosting and nesting habitat must contain tall or dense mature trees with suitable hollows. Favoured nesting hollows are near-vertical spouts or large hollows in trunks of large eucalypts. They forage mainly upon terrestrial prey in adjoining open habitat, occasionally preying upon arboreal or scansorial mammals. Rats form a large part of their diet.</p> <p>The Sooty Owl essentially occupies wet sclerophyll forests where it has a varied diet, consisting of both arboreal prey (eg Greater Gliders, Common Ringtail Possums) and terrestrial prey (rats). The Sooty Owl roosts within rainforest or within caves.</p> <p>None of these species were recorded during spotlighting, however it is likely that each species is at least an occasional visitor to the subject site.</p> |
| 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 | The proposal will result in the removal of approximately 1.284 ha of potential foraging habitat for these species. No known breeding trees are proposed to be removed. Due to the presence of several thousand hectares of commensurate habitat within the locality, the level of habitat removal is considered to be insignificant. The proposed intensification of activities will lead to increased night-time noise, dust and light levels, however the area of habitat to be impacted is again negligible compared to the available habitat overall and so the action should not significantly impact on the owls. It is therefore concluded that the proposal is unlikely to result in an adverse effect on the life cycle of the Powerful and Masked Owls, such that, a viable local population is likely to be placed at risk of 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 | N/A |
| c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: <ul style="list-style-type: none"> i. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or ii. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction | N/A |

| Large Forest Owls (Powerful Owl, Sooty Owl and Masked Owl) | |
|---|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| <p>d) In relation to the habitat of a threatened species, population or ecological community:</p> <ol style="list-style-type: none"> The extent to which habitat is likely to be removed or modified as a result of the action proposed, and Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and 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. | <p>Approximately 1.284 ha of habitat is proposed to be removed as a result of this proposal. While the proposal will increase the level of fragmentation between surrounding areas of dry sclerophyll forest due to the construction of a new access road. The level of fragmentation is unlikely to significantly affect the movement of large forest owls within the landscape.</p> <p>The habitat proposed for removal is not considered to be important for the long term survival of the Powerful Owl, Sooty Owl or Masked Owl, due to the presence of several thousand hectares of commensurate habitat immediately adjacent to the study area.</p> <p>The increased intensification of activities with the associated increase in light, dust and noise is not expected to impact significantly on the habitat of these species as there is no expected direct impact or modification of the habitat by these actions.</p> |
| <p>e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)</p> | <p>Under the TSC Act, the Director-General maintains a Register of critical habitat. To date, no critical habitat has been declared for the Powerful Owl, Masked Owl or Sooty Owl.</p> |
| <p>f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or TAP</p> | <p>A recovery plan for large forest owls has been prepared by DEC (2006). This plan refers to the three species Powerful Owl, Masked Owl and Sooty Owl. The specific objectives of this plan are:</p> <p>Assess the distribution and amount of high quality habitat for each owl species across public and private lands to get an estimate of the number and proportion of each species that are, and are not, protected</p> <p>To monitor trends in population parameters (numbers, distribution, territory fidelity and breeding success) across the range of the three species and across different land tenures and disturbance histories</p> <p>To assess the implementation and effectiveness of forest management prescriptions designed to mitigate the impact of timber-harvesting operations on the three owl species and, (if necessary), to use this information to refine the prescriptions so that forestry activities on state forests are not resulting in adverse changes in species abundance and breeding success</p> <p>Ensure the impacts on large forest owls and their habitats are adequately assessed during planning and environmental assessment processes</p> <p>Minimise further loss and fragmentation of habitat by protection and more informed management of significant owl habitat (including protection of individual nest sites)</p> <p>To improve the recovery and management of the three large forest owls based on an improved understanding of key areas of their biology and ecology</p> <p>To raise awareness of the conservation requirements of the three large forest owls amongst the broader community, to involve the community in owl conservation efforts and in doing so increase the information base about owl habitats and biology</p> <p>To coordinate the implementation of this recovery plan and continually seek to integrate actions in this plan with actions in other recovery plans or conservation initiatives.</p> <p>Objective 4 and 5 are considered relevant to this proposal. The action proposed does not involve any removal of known nesting or roosting habitat for the large forest owls, this is consistent with Objective 5. The impacts of the proposal are being adequately assessed, which is consistent with objective 4.</p> |
| <p>g) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP</p> | <p>To date, 37 Key Threatening Processes have been declared under the TSC Act. The proposal may potentially constitute or promote the following listed KTP under the NSW TSC Act.</p> <ul style="list-style-type: none"> Clearing of native vegetation Competition from feral honeybees <i>Apis mellifera</i> Loss of hollow-bearing trees Removal of dead wood and dead trees <p>Other threats to this species include:</p> <ul style="list-style-type: none"> Historical loss and fragmentation of suitable forest and woodland habitat from land clearing for residential and agricultural development. This loss also affects the populations of arboreal prey species, particularly the Greater Glider which reduces food availability for the Powerful Owl and Sooty Owl. Inappropriate forest harvesting practices that have changed forest structure and removed old growth hollow-bearing trees. Loss of hollow-bearing trees reduces the availability of suitable nest sites and prey habitat Can be extremely sensitive to disturbance around the nest site, particularly during pre-laying, laying and downy chick stages. Disturbance during the breeding period may affect breeding success. |

| Large Forest Owls (Powerful Owl, Sooty Owl and Masked Owl) | |
|--|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| | <ul style="list-style-type: none"> High frequency hazard reduction burning may also reduce the longevity of individuals by affecting prey availability. Road Kills Secondary poisoning Predation of fledglings by foxes, dogs and cats (DECCW undated). <p>The proposed development is unlikely to significantly contribute to any of these processes.</p> |
| <p>Conclusion: The proposed action is unlikely to have a significant impact on the Powerful Owl, Sooty Owl and Masked Owl due to the removal of a minimal amount (1,284 hectares) of potential foraging habitat and the increased intensification will also affect only a minimal area of already affected habitat. Therefore a Species Impact Statement is not required.</p> | |

| Spotted-tailed Quoll | |
|--|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| Background | <p>The Spotted-tailed Quoll is listed as vulnerable under the TSC Act and is about the size of a domestic cat, from which it differs most obviously in its shorter legs and pointed face. The average weight of an adult male is about 3500 grams and an adult female about 2000 grams. It has rich-rust to dark-brown fur above, with irregular white spots on the back and tail, and a pale belly. The spotted tail distinguishes it from all other Australian mammals, including other quoll species. However, the spots may be indistinct on juvenile animals. The Spotted-tailed Quoll has been recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.</p> <p>The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares. They usually traverse their ranges along densely vegetated creeklines.</p> <p>The subject site provides suitable foraging habitat for this species, but was not recorded during field surveys.</p> |
| 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 | <p>The proposal will result in the removal of less than 1,284 ha of potential foraging (and possible denning) habitat for this species. Several thousand hectares of suitable foraging habitat occurs adjacent to the subject site.</p> <p>The proposed intensification of activities will lead to increased night-time noise, dust and light levels, however the area of habitat to be impacted is again negligible compared the available habitat overall and so the action should not significantly impact on the Quoll.</p> <p>It is therefore concluded that the proposal is unlikely to result in an adverse effect on the life cycle of the Spotted-tail Quoll, such that, a viable local population is likely to be placed at risk of extinction.</p> |
| 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 | N/A |
| c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: <ul style="list-style-type: none"> i. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or ii. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction | N/A |
| d) In relation to the habitat of a threatened species, population or ecological | <p>Approximately 1,284 ha of habitat is proposed to be removed as a result of this proposal.</p> <p>The proposal will construct a new road, however due to the small size of this road and</p> |

| Spotted-tailed Quoll | |
|--|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| <p>community:</p> <p>i. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and</p> <p>ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and</p> <p>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.</p> | <p>infrequent night traffic on the road, its unlikely that the road will limit the dispersal ability of the Quoll across the road.</p> <p>The habitat proposed for removal is not considered to be important for the long term survival of the Spotted-tail Quoll due to several thousand hectares of commensurate habitat being located elsewhere within the locality, including a number of conservation reserves.</p> <p>The increased intensification of activities with the associated increase in light, dust and noise is not expected to impact on the habitat of this species</p> |
| <p>e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)</p> | <p>Under the TSC Act, the Director-General maintains a Register of critical habitat. As at 30 May 2014, no critical habitat has been declared for any of the Spotted-tailed Quoll.</p> |
| <p>f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or TAP</p> | <p>No recovery plan has been prepared the Spotted-tailed Quoll. However 35 action priority statements have been identified being::</p> <ul style="list-style-type: none"> • Establish and maintain regional working groups in southeast and northeast NSW to coordinate research and management. • Research disturbance thresholds and adequacy of existing prescriptions for retention of habitat of breeding females in timber production forests. • Renegotiate habitat retention prescriptions in IFOAs if they are found to be inadequate following research into disturbance thresholds and habitat requirements of breeding females. • Research to investigate interactions between native and exotic predators and their prey to better understand the consequences of 1080 baiting at an ecosystem level. • Based on research, develop and implement a protocol for use of poison baits that further reduces impacts on individual Spotted-tailed Quolls. • Investigate the demographics of Spotted-tailed Quoll populations and use results to develop viability models for quoll populations. • Investigate the impact of fox and wild dog baiting on Spotted-tailed Quoll populations. • Assess potential risk Cane Toads pose to populations of quolls. • Monitor survival of Spotted-tailed Quoll populations in habitat newly colonised by cane toads. • The threat of cane toads to be assessed as part of the DEC Cane Toad Action Plan. • Seminar on quoll biology and conservation. • Review survey methods and assess effectiveness of different techniques to identify an optimal survey protocol. Undertake research into new methods, if necessary. • Conduct field and community surveys for the Spotted-tailed Quoll in areas where its distribution is poorly known. Areas identified for large-scale urban development (i.e. Far north coast, Hunter) and coastal reserves should be the highest priority. • Map Spotted-tailed Quoll distribution and update as additional data becomes available. • Identify study sites across the NSW range and within different habitat types at which long-term population monitoring can be undertaken. • Conduct systematic monitoring at key sites. Monitoring sites will be distributed across the NSW range of the Spotted-tailed Quoll and within different habitat types such as Kosciusko NP, Limeburner's Creek NR, northern tablelands and the Blue Mountains. • Develop a database and update it regularly to track population trends at monitoring sites, particularly with respect to density and survival of breeding females. • Develop standard data collection protocol to maximise information obtained from field surveys. Include procedure for monitoring disease status of wild animals and collecting and storing genetic samples. • Collect genetic samples from all Spotted-tailed Quoll populations during field surveys and regular monitoring activities. • Continue to undertake research on genetic diversity of populations to guide identification of appropriate genetic management units throughout range. • Conduct and publish ecological research on relationship between prey density, den availability and density of females in different habitat types to determine measures |

| Spotted-tailed Quoll | |
|---|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| | <p>of habitat quality.</p> <ul style="list-style-type: none"> • Liaise with key aboriginal groups and document understanding of Spotted-tailed Quoll's local distribution, abundance, ecology and threats. • Develop a licence agreement with managers of captive Spotted-tailed Quoll populations to enable recruitment to captive populations from wild populations. • Develop agreement with captive management institutions to facilitate use of captive animals for research when required. • Develop a communication strategy to raise public awareness of the Spotted-tailed Quoll, compile education resources and distribute to identified target audiences. Support community participation in survey and monitoring programs. • Consult with Aboriginal land managers regarding intended conservation management efforts for Spotted-tailed Quolls on lands of interest to them. • Erect signs in areas where road kills are common to alert drivers to the presence of Spotted-tailed Quolls. • Identify sections of roads where Spotted-tailed Quolls are frequently killed on roads. Conduct a media campaign to ask for public records of road kills and use data held by the relevant government agencies. • At sections of roads where Spotted-tailed Quolls are frequently killed, incorporate methods to reduce the numbers of animals killed. Assess the effectiveness of different mitigation methods. • Prepare brochure detailing designs of 'quoll-proof' poultry runs and aviaries and distribute within relevant locations. • Seek funding or sponsorship to subsidise landholder costs of modifying poultry runs and aviaries. • Habitat requirements of Spotted-tailed Quolls to be adequately conserved within environmental planning instruments and through other legislative protection mechanisms, including property vegetation plans. • Develop environmental impact assessment guidelines for the Spotted-tailed Quoll, which includes information on adequate survey methods, survey effort, inappropriate development proposals and impact mitigation measures. • Reserve Fire management Strategy(s) include operational guidelines that protect rocky outcrops and riparian zones within areas of known habitat. • Research and publish findings to determine impact of wildfires and prescription burns on populations, with emphasis on prey resources, refugia, impacts of foxes, cats and wild dogs/dingoes. <p>The proposal does not relate to any of the other actions.</p> |
| g) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP | <p>The proposal may potentially constitute or promote a number of KTPs under the NSW TSC Act, as listed below. However, each of these processes are already in operation within the subject site and the proposal includes measures to reduce additional impacts from the proposal.</p> <ul style="list-style-type: none"> • Clearing of native vegetation • Removal of dead wood and dead trees • Invasion and establishment of exotic vines and scramblers • Invasion of native plant communities by exotic perennial grasses. <p>The proposal will incrementally contribute to the increased operation of the above KTPs.</p> |
| <p>Conclusion: The proposed action is unlikely to have a significant impact on the Spotted-tailed Quoll due to only a small area of habitat being proposed for removal (1.284ha). The increased intensification will also affect only a minimal area of already affected habitat. Thus a Species Impact Statement is not required.</p> | |

| Squirrel Glider | |
|---|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| Background | <p>Squirrel Gliders is listed as vulnerable under the TSC Act and inhabit mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. They prefer mixed species stands with a shrub or Acacia midstorey and they live in family groups of a single adult male one or more adult females and offspring. They require abundant tree hollows for refuge and nest sites.</p> <p>Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein (DECCW undated).</p> <p>An individual Squirrel Glider requires three essential elements during its life cycle; roosting and</p> |

| Squirrel Glider | |
|--|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| | den trees, foraging habitats (can include year round flowering resources), and accessibility to mating partners. This species was not recorded during the spotlight survey, however the habitat may be utilised for denning and foraging by the species. |
| 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 | <p>The proposal will result in the removal of less than 1.284 ha of potential foraging and denning habitat for this species, however this level of removal is insignificant when compared to several thousand hectares of commensurate habitat within the locality. The proposed intensification of activities will lead to increased night-time noise, dust and light levels, however the area of habitat to be impacted is again negligible compared the available habitat overall and so the action should not significantly impact on the Squirrel Glider.</p> <p>It is therefore concluded that the proposal is unlikely to result in an adverse effect on the life cycle of the Squirrel Glider, such that, a viable local population is likely to be placed at risk of extinction.</p> |
| 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 | N/A |
| c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: <ul style="list-style-type: none"> i. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or ii. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction | N/A |
| d) In relation to the habitat of a threatened species, population or ecological community: <ul style="list-style-type: none"> i. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and iii. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality. | <p>Approximately 1.284 ha of habitat is proposed for to be removed as a result of this proposal. The proposal will result in increased fragmentation in a small area due to the construction of a new access road. However due to the level of habitat connectivity adjacent to the study area, this activity is unlikely to significantly limit the dispersal ability of the Squirrel Glider in the locality.</p> <p>The habitat proposed for removal is not considered to be important for the long term survival of the Squirrel Glider due being commensurate with a large proportion of similar habitat within the locality.</p> <p>The increased intensification of activities with the associated increase in light, dust and noise is not expected to impact on the habitat of the species.</p> |
| e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly) | Under the TSC Act, the Director-General maintains a Register of critical habitat. As at 30 th May 2014, no critical habitat has been declared for any of the Squirrel Glider. |
| f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or TAP | <p>The following priority actions have been identified for the Squirrel Glider:</p> <ul style="list-style-type: none"> • Conduct surveys on the Far South Coast, from Murramarong National Park south to Eden, to determine population size and extent and connectivity of populations (surveys should incorporate potential habitat on public as well as private land). • Model and predict the distribution of Squirrel Gliders across the south west slopes. • Delineate boundaries of population to identify the extent to which populations are interconnected (to determine propensity to move across cleared land). • Ensure the largest hollow bearing trees (including dead trees) are given highest priority for retention in PVP assessments and other environmental planning instruments, or other land assessment tools. • Control feral horses at relevant sites to promote retention and growth of mid-storey shrubs. |

| Squirrel Glider | |
|--|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| | <ul style="list-style-type: none"> • Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity. Give priority to largest hollow bearing trees. • Investigate the effectiveness of logging prescriptions. • Prepare a recovery plan for the Squirrel Glider. • Conduct surveys and assessments of less known sites to confirm presence of species and negotiate, develop and implement conservation management agreements for high priority sites. <p>However none of these actions relate to the proposal.</p> |
| g) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP | <p>The proposal may potentially constitute or promote a number of KTPs under the NSW TSC Act, as listed below. However, each of these processes are already in operation within the subject site and the proposal includes measures to reduce additional impacts from the proposal.</p> <ul style="list-style-type: none"> • Clearing of native vegetation • Competition from feral honeybees <i>Apis mellifera</i> • Removal of dead wood and dead trees • Loss of tree hollows <p>The proposal will incrementally contribute to the increased operation of the above KTPs.</p> |
| <p>Conclusion: The proposed action is unlikely to have a significant impact on the Squirrel Glider due to the small extent of removal of suitable habitat (1.284ha) and the increased intensification will also affect only a minimal area of already affected habitat. Therefore a Species Impact Statement is not required.</p> | |

| Koala | |
|--|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| Background | <p>The Koala is listed as vulnerable under the TSC Act and is an arboreal marsupial with fur ranging from grey to brown above, and white below. It has large furry ears, a prominent black nose and no tail. It spends most of its time in trees and has long, sharp claws, adapted for climbing. Adult males weigh 6 - 12 kg and adult females weigh 5 - 8 kg. During breeding, males advertise with loud snarling coughs and bellows.</p> <p>The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the western region. It was historically abundant on the south coast of NSW, but now occurs in sparse and possibly disjunct populations. Koalas are also known from several sites on the southern tablelands.</p> <p>Koalas inhabit eucalypt woodlands and forests where they feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. They are inactive for most of the day, feeding and moving mostly at night. They spend most of their time in trees, but will descend and traverse open ground to move between trees. Their home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.</p> <p>Koalas are generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year.</p> <p>Potential Koala habitat occurs in the broader locality and historical records occur. No Koalas were recorded during the field survey.</p> |
| 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 | <p>The proposal will result in the removal of approximately 1.284 ha of possible Koala habitat. However several thousand hectares of commensurate habitat occurs within the locality and searches have indicated that the koala is not currently present on site. It is therefore concluded that the proposal is unlikely to result in an adverse effect on the life cycle of the Koala, such that, a viable local population is likely to be placed at risk of extinction.</p> |

| Koala | |
|--|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| 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 | N/A |
| c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: <ol style="list-style-type: none"> i. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or ii. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction | N/A |
| d) In relation to the habitat of a threatened species, population or ecological community: <ol style="list-style-type: none"> i. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and iii. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality. | <p>Approximately 1.284 ha of habitat is proposed for to be removed as a result of this proposal. The proposal will result in increased fragmentation in a small area due to the construction of a new access road. However due to the level of habitat connectivity adjacent to the study area, this activity is unlikely to significantly limit the dispersal ability of the Koala in the locality.</p> <p>The habitat proposed for removal is not considered to be important for the long term survival of the Koala with no Koalas being recorded during the field surveys (compared to other areas where Koalas were recorded) and because several thousand hectares of occupied habitat occurs adjacent to the proposal area.</p> <p>The increased intensification of activities with the associated increase in light, dust and noise is not expected to impact on the habitat of this species</p> |
| e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly) | Under the TSC Act, the Director-General maintains a Register of critical habitat. As at 30 May 2014, no critical habitat has been declared for any of the Koala. |
| f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or TAP | <p>A NSW recovery plan (DECC 2008) has been prepared for this species and lists 7 objectives:</p> <ul style="list-style-type: none"> To conserve koalas in their existing habitat To rehabilitate and restore koala habitat and populations To develop a better understanding of the conservation biology of koalas To ensure that the community has access to factual information about the distribution, conservation and management of koalas at a national, state and local scale To manage overbrowsing to prevent both koala starvation and ecosystem damage in discrete patches of habitat To coordinate, promote the implementation, and monitor the effectiveness of the NSW Koala Recovery Plan across NSW. <p>The proposal is generally consistent with these objectives.</p> |
| g) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP | <p>The proposal may potentially constitute or promote a number of KTPs under the NSW TSC Act, as listed below. However, each of these processes are already in operation within the subject site and the proposal includes measures to reduce additional impacts from the proposal.</p> <ul style="list-style-type: none"> • Clearing of native vegetation |
| <p>Conclusion: The proposed action is unlikely to have a significant impact on the Koala due to the small amount (1.284ha) of habitat proposed for removal. The increased intensification will also affect only a minimal area of already affected habitat. Therefore a Species Impact Statement is not required.</p> | |

Brush-tailed Phascogale

| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
|---|--|
| Background | <p>The Brush-tailed Phascogale is listed as vulnerable under the TSC Act and is a scansorial marsupial carnivore, weighing up to 150 grams. In accordance with most Dasyurids (marsupial carnivores) the males die after only one year, leaving only females within the population. The Brush-tailed Phascogale is found in Victoria and southeastern New South Wales (south of Wollongong), north of the Hunter River to Newcastle and in the Northern Territory and in Western Australia. Genetic studies have shown that four genetically distinct 'units' occur. In the population north of the Hunter River, little is known as to their ecology. However a study in the State Forests of near Taree found that their home range was approximately 15 ha and that they had a relatively high density within Coastal Blackbutt forest.</p> <p>This species was not recorded during the field surveys.</p> |
| <p>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</p> | <p>The proposal will result in the removal of 1.284 ha of potential foraging habitat for this species which is less than 1% of the habitat available in the study area (over 4000 hectares of suitable foraging habitat occurs within the locality). The proposed intensification of activities will lead to increased night-time noise, dust and light levels, however the area of habitat to be impacted is again negligible compared the available habitat overall and so the action should not significantly impact on the Phascogale.</p> <p>It is therefore concluded that the proposal is unlikely to result in an adverse effect on the life cycle of the Brush-tailed Phascogale, such that, a viable local population is likely to be placed at risk of extinction.</p> |
| <p>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</p> | N/A |
| <p>c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:</p> <p>iii. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</p> <p>iv. 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</p> | N/A |
| <p>d) In relation to the habitat of a threatened species, population or ecological community:</p> <p>iv. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and</p> <p>v. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and</p> <p>vi. 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.</p> | <p>Approximately 1.284 ha of already degraded habitat is proposed to be removed as a result of this proposal, including seven hollow bearing trees, which represents less than 1% of the available habitat in the study area.</p> <p>The proposal will result in minimal further fragmentation of habitat in the area as the construction of a new access road will follow an existing road route and the expanded stockpile area will see the removal of only already isolated vegetation. However due to the high level of habitat connectivity adjacent to the study area, this activity is unlikely to significantly limit the dispersal ability of the Brush-tailed Phascogale in the locality.</p> <p>The habitat proposed for removal is not considered to be important for the long term survival of the Brush-tailed Phascogale, as it is commensurate with several thousand hectares of other habitat within the locality.</p> <p>The increased intensification of activities with the associated increase in light, dust and noise is not expected to impact on the habitat of the species.</p> |
| <p>e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)</p> | <p>Under the TSC Act, the Director-General maintains a Register of critical habitat. As at 30 May 2014, no critical habitat has been declared for the Brush-tailed Phascogale.</p> |
| <p>f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or TAP</p> | <p>No recovery plan has been prepared for this species. The following priority actions have been prepared:</p> <ul style="list-style-type: none"> • Establish a long term monitoring program of Brush-tail Phascogales across at least 30 sites. • Undertake a targeted community education program that raises awareness of |

| Brush-tailed Phascogale | |
|--|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| | <p>threats such as cats</p> <ul style="list-style-type: none"> • Develop and provide environmental assessment guidelines for Local Councils and other consent or determining authorities to enable adequate consideration of the potential impacts of activities or actions on phascogales. • Monitor the effectiveness of forestry threatened species licence conditions and refine and negotiate changes if required. • Undertake research into the impact of hazard reduction burn practices. • Undertake fox and wild dog control at priority sites. • Design and implement an ecological burn (Dinner Creek) including habitat requirements of the species in Demon Nature Reserve. <p>However none of these priority actions relate to the current proposal.</p> |
| g) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP | <p>The proposal may potentially constitute or promote a number of KTPs under the NSW TSC Act, as listed below. However, each of these processes are already in operation within the subject site and the proposal includes measures to reduce additional impacts from the proposal.</p> <ul style="list-style-type: none"> • Clearing of native vegetation • Competition from feral honeybees <i>Apis mellifera</i> • Removal of dead wood and dead trees • Loss of tree hollows |
| <p>Conclusion: The proposed action is unlikely to have a significant impact on the Brush-tailed Phascogale, due to the removal of a relatively small area of potential habitat (1.284ha) and provision of nest boxes to offset hollow loss. The increased intensification will also affect only a minimal area of already affected habitat. Therefore a Species Impact Statement is not required.</p> | |

| Rufous Bettong | |
|---|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| Background | <p>Rufous Bettongs are small marsupials, 70 to 80 cm long from nose to tail. They have reddish-brown fur, including on the muzzle. They normally move quite slowly by placing the forelegs on the ground and bringing the hindlegs forward together, but can also hop like a kangaroo. When alarmed they stamp their hindfeet on the ground. They are known to use their tails to carry nesting material. They occur in grassy forests north from Mt Royal in the Western Barrington Tops into Queensland. Historically their range was much larger, extending into Queensland, however the species has significantly declined. This decline may have occurred due to increased levels of Fox predation or habitat alteration.</p> |
| 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 | <p>The proposal will result in the removal of 1.284 ha of potential foraging habitat for this species. Several thousand hectares of suitable foraging habitat occurs within the locality. The proposed intensification of activities will lead to increased night-time noise, dust and light levels, however the area of habitat to be impacted is again negligible compared the available habitat overall and the area already affected by the same impacts, albeit for less time per week, so the action should not significantly impact on the Rufous Bettong.</p> <p>It is therefore concluded that the proposal is unlikely to result in an adverse effect on the life cycle of the Brush-tailed Phascogale, such that, a viable local population is likely to be placed at risk of extinction.</p> |
| 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 | N/A |
| c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: <ul style="list-style-type: none"> v. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or vi. Is likely to substantially and adversely modify the composition of the | N/A |

| Rufous Bettong | |
|---|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| ecological community such that its local occurrence is likely to be placed at risk of extinction | |
| <p>d) In relation to the habitat of a threatened species, population or ecological community:</p> <p>vii. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and</p> <p>viii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and</p> <p>ix. 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.</p> | <p>Approximately 1.284 ha of already degraded habitat is proposed to be removed as a result of this proposal, including seven hollow bearing trees, which represents less than 1% of the available habitat in the study area.</p> <p>The proposal will result in minimal further fragmentation of habitat in the area as the construction of a new access road will follow an existing road route and the expanded stockpile area will see the removal of only already isolated vegetation. However due to the high level of habitat connectivity adjacent to the study area, this activity is unlikely to significantly limit the dispersal ability of the Rufous Bettong in the locality.</p> <p>The habitat proposed for removal is not considered to be important for the long term survival of the Rufous Bettong, as it is commensurate with several thousand hectares of other habitat within the locality.</p> <p>The increased intensification of activities with the associated increase in light, dust and noise is not expected to impact on the habitat of this species.</p> |
| e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly) | Under the TSC Act, the Director-General maintains a Register of critical habitat. As at 30 th May 2014, no critical habitat has been declared for the Rufous Bettong. |
| f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or TAP | <p>No recovery plan has been prepared for this species. The following priority actions have been prepared:</p> <ul style="list-style-type: none"> • Continue fox control at priority sites and assess the need for fox control at further sites. • Prepare EIA guidelines and distribute to consent authorities. • Continue to develop and refine appropriate survey techniques for the Rufous Bettong. • Conduct surveys for Rufous Bettongs in the west of its range. Continue to survey for the species in areas already subject to surveys. • Undertake research into genetic variance of Rufous Bettong populations. • Include / Review operational guidelines for Reserve Management Strategies to protect this species habitat from fire by promoting preferred vegetation structure and a mosaic burns. • Control feral herbivores in potential habitat for this species. • Design and implement an ecological burn (Dinner Creek) including habitat requirements of the species in Demon Nature Reserve. • Control weeds in known habitat for this species. • Manage and protect shelter and foraging habitat in conservation reserves through Plans of Management and fire management plans. • Consider landscape-scale connectivity of habitat in planning. • Where appropriate, develop fire management guidelines based on fire regimes appropriate to maintain foraging and shelter habitat. • Maintain vegetation structure and habitat mosaic at a landscape level through fire management. • Where appropriate, undertake strategic stock grazing or exclusion to maintain habitat. • Provide guidelines to landholders on how to appropriately manage rufous bettong habitat. • Assess the significance of rufous bettongs to indigenous communities. • Assess the effectiveness of private and public forest management prescriptions, and suggest appropriate amendments. <p>However none of the above actions directly relate to this proposal.</p> |
| g) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP | <p>The proposal may potentially constitute or promote a number of KTPs under the NSW TSC Act, as listed below. However, each of these processes are already in operation within the subject site and the proposal includes measures to reduce additional impacts from the proposal.</p> <ul style="list-style-type: none"> • Clearing of native vegetation |
| <p>Conclusion: The proposed action is unlikely to have a significant impact on the Rufous Bettong, due to the removal of a relatively small area of clearance proposed (1.284 ha). In addition, the increased intensification will also affect only a minimal area of already affected habitat. Thus a Species Impact Statement is not required.</p> | |

| Glossy Black Cockatoo | |
|---|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| Background | <p>The Glossy Black-cockatoo lives in coastal woodlands and forest areas, open inland woodlands or timbered watercourses where casuarinas (or sheoaks), its main food trees, are common.</p> <p>The Glossy Black-cockatoo has a patchy distribution in Australia, having once been widespread across most of the south-eastern part of the country. It is now distributed throughout an area which extends from the coast near Eungella in eastern Queensland to Mallacoota in Victoria. An isolated population of Glossy Black-cockatoos is also known to live on Kangaroo Island in South Australia. The species has become regionally extinct in parts of western Victoria and south-eastern South Australia.</p> <p>In NSW, the current distribution of the Glossy Black-cockatoo covers areas from the coast to the tablelands, and as far west as the Riverina and Pilliga Scrub.</p> <p>The study area supports stands of Allocasuarinas so is potential foraging habitat for this species.</p> |
| 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 | <p>The proposal will result in the removal of approximately 1.284 ha of already degraded, but still potentially suitable habitat including several hollow bearing trees. This is < 1% of the several thousand hectares of commensurate habitat occurs within the locality and the loss of hollows will be offset through the use of nest boxes. The proposed intensification of activities will lead to increased night-time noise, dust and light levels. However the area of habitat to be impacted is again negligible compared the available habitat overall and is already impacted by the same light, sound and dust, albeit for lesser period of time, so the action should not significantly impact on the Glossy Black Cockatoo.</p> <p>It is therefore concluded that the proposal is unlikely to result in an adverse effect on the life cycle of the Glossy Black-cockatoo, such that, a viable local population is likely to be placed at risk of extinction.</p> |
| 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 | N/A |
| c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: <ul style="list-style-type: none"> vii. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or viii. 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 | N/A |
| d) In relation to the habitat of a threatened species, population or ecological community: <ul style="list-style-type: none"> x. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and xi. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and xii. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological | <p>Approximately 1.284 ha of already degraded habitat is proposed to be removed as a result of this proposal, including seven hollow bearing trees, which represents less than 1% of the available habitat in the study area.</p> <p>The proposal will result in minimal further fragmentation of a small area due to the construction of a new access road along an existing road route and the expanded stockpile will remove already relatively isolated vegetation. However due to the level of habitat connectivity adjacent to the study area and mobility of this species, this activity is unlikely to significantly limit the dispersal ability of the Glossy Black-cockatoo in the locality.</p> <p>The habitat proposed for removal is not considered to be important for the long term survival of the Glossy Black-cockatoo, as it is commensurate with several thousand hectares of other habitat within the locality.</p> <p>The increased intensification of activities with the associated increase in light and noise is not expected to impact on the habitat of this species and more than it already has been.</p> |

| Glossy Black Cockatoo | |
|---|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| community in the locality. | |
| e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly) | Under the TSC Act, the Director-General maintains a Register of critical habitat. However as at 30 th May 2014, no critical habitat has been declared for the Glossy Black-cockatoo. |
| f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or TAP | <p>No recovery plan has been prepared for this species. The following priority actions have been prepared:</p> <ul style="list-style-type: none"> Identify and map key breeding and foraging habitat, similar to the mapping done by Robinson (2004) at St Georges Basin. Provide incentives for landholders to fence and manage key sites. Assist landholders who wish to enter into voluntary conservation agreements at key sites. Prepare and distribute EIA guidelines to decision makers. Periodically review IFOA prescriptions to ensure adequate protection of nesting and foraging habitat. Develop/encourage strategic planning approach for Glossy Black Cockatoo at the local and regional level. Encourage the restoration of foraging habitat that has been cleared or degraded by previous impacts. Increase landholder and public awareness and interest in Glossy Black Cockatoo conservation and habitat management. Utilise the Glossy Black Cockatoo as a flagship threatened species for woodland and forest conservation education and awareness programs. Continue existing monitoring programs (e.g. Goonoo population) and encourage other community groups to develop a monitoring program of local populations. Map distribution and condition of foraging habitat. Prepare and distribute information to decision makers. Increase landholder and public awareness of status, threats and priority actions. Investigate breeding biology and foraging ecology. Monitor population size and recruitment annually. Identify nest sites and map distribution of nesting habitat. Provide input to local fire management plans to ensure appropriate management of habitat. Develop and implement management plans for important areas of habitat. Provide incentives for landholders to fence and manage important areas of habitat. Undertake co-ordinated control of feral herbivores. Increase the extent of foraging and nesting habitat. Negotiate management agreements and covenants over important areas of habitat. <p>However none of the above actions directly relate to the proposal.</p> |
| g) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP | <p>The proposal may potentially constitute or promote a number of KTPs under the NSW TSC Act, as listed below. However, each of these processes are already in operation within the subject site and the proposal includes measures to reduce additional impacts from the proposal.</p> <ul style="list-style-type: none"> Clearing of native vegetation Competition from feral honeybees <i>Apis mellifera</i> Removal of dead wood and dead trees Loss of tree hollows |
| <p>Conclusion: The proposed action is unlikely to have a significant impact on the Glossy Black Cockatoo, due to the removal of a relatively small area of potential habitat (1.284ha) and provision of nest boxes to offset any hollow loss. The increased intensification in activities will also affect only a minimal area of already affected habitat. Thus a Species Impact Statement is not required.</p> | |

| Cave-dependent microbat species (Large-eared Pied Bat, Eastern Bent Wing Bat, Little Bent Wing Bat) | |
|---|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| Background | |
| 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 | No overhangs or caves will be affected by the proposal and do not occur adjacent or within the study area. The proposal will require the removal of 1.284 ha of foraging habitat. However due to the presence of several thousand hectares of commensurate foraging habitat within the locality, the proposal is unlikely to affect the life cycle of threatened cave dependent microbat |

| Cave-dependent microbat species (Large-eared Pied Bat, Eastern Bent Wing Bat, Little Bent Wing Bat) | |
|--|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| local population of the species is likely to be placed at risk of extinction | species, such that, a local population is placed at risk of extinction. The proposed intensification of activities will lead to increased night-time noise, dust and light levels that will impact on foraging habitats. However the area of habitat to be impacted is negligible compared the available habitat and has already subject to noise and light impacts for over 25 years. Overall the action should not significantly impact on these Cave-dependent batsl. |
| 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 | N/A |
| c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: ix. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or x. 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 | N/A |
| d) In relation to the habitat of a threatened species, population or ecological community: xiii. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and xiv. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and xv. 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. | Approximately 1.284 ha of already degraded habitat is proposed to be removed as a result of this proposal, which represents less than 1% of the available habitat in the study area. The proposal will result in minimal further fragmentation of a small area due to the construction of a new access road along an existing road route and the expanded stockpile will remove already relatively isolated vegetation. However due to the high level of habitat connectivity adjacent to the study area and the mobility of these species, this activity is unlikely to significantly limit the dispersal ability of threatened cave dependent bat species in the locality. The habitat proposed for removal is not considered to be important for the long term survival of cave dependent bat species, as it is commensurate with several thousand hectares of other habitat within the locality. The increased intensification of activities with the associated increase in light and noise is not expected to impact on the habitat of these species. |
| e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly) | Under the TSC Act, the Director-General maintains a Register of critical habitat. As of 30 th May 2014 no critical habitat has been prepared for these species. |
| f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or TAP | No recovery plan has been prepared for this species. The following priority actions have been prepared: Little Bent Wing <ul style="list-style-type: none"> Promote bats throughout the rural community as ecologically interesting and important, but sensitive to disturbance at caves/disused mine tunnels. Identify the susceptibility of the species to pesticides. Undertake non-chemical removal of weeds (e.g. lantana, blackberry) to prevent obstruction of cave entrances. Establish a gateing design for disused mines across species range that will not adversely impact species. Restrict caving activity during critical times of year in important roosts used by species, particularly maternity and hibernation roosts. Restrict access where possible to known maternity sites. (e.g: signs). Monitor the breeding success of maternity colonies in cave roosts over a number of years to determine the viability of regional populations. Undertake a regular census of maternity colonies (e.g. Willi Willi) and other key roosts in network, especially where there are population estimates from banding in the 1960s. |

| Cave-dependent microbat species (Large-eared Pied Bat, Eastern Bent Wing Bat, Little Bent Wing Bat) | |
|---|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| | <ul style="list-style-type: none"> • For roost caves vulnerable to human disturbance, monitor their visitation by people, particularly during winter and spring/summer maternity season and in school holidays. • Measure genetic population structure among cave roosts of maternity colonies to estimate dispersal and genetic isolation, and vulnerability to regional population extinction. • Study the effect of different burning regimes on cave disturbance and surrounding foraging habitat. • Control foxes and feral cats around roosting sites, particularly maternity caves and hibernation sites. • Study the ecological requirements of maternity colonies and their environs and migratory patterns. • Identify important foraging range and key habitat components around significant roosts. • Identify types of winter roosts used by species. Winter roosts suspected to be banana palms and tree hollows. • Search for significant roost sites and restrict access where possible. (e.g. gating of caves). Significant includes maternity, hibernation and transient sites including in artificial structures. • Compile register of all known roost sites in natural and artificial structures including current and historical data and identify significance of roost, e.g. maternity, hibernation, transient roost. • Prepare fire management plans for significant roost caves, disused mines, culverts, especially maternity and winter roosts. • Exclude prescription burns from 100m from cave entrance, ensure smoke/flames of fires do not enter caves/roosts in artificial structures. • Protect significant roosts and forest habitat within 10 km of roosts in PVP assessments (offsets should include nearby remnants in high productivity) and other environmental planning instruments. • Control goats around roosting sites, particularly maternity caves and hibernation sites. • Promote the conservation of these significant roost areas using measures such as incentive funding to landholders, offsetting and biobanking, acquisition for reserve establishment or other means. • Determine the effectiveness of PVP assessment, offsets and actions for bats. • Prepare management plans for significant bat roosts especially all known maternity colonies and winter colonies. • Identify and protect significant roost habitat in artificial structures (eg culverts, old buildings and derelict mines). <p>Eastern Bent Wing</p> <ul style="list-style-type: none"> • Promote bats throughout the rural community as ecologically interesting and important, but sensitive to disturbance at caves/disused mine tunnels. • Undertake non-chemical removal of weeds (e.g. lantana, blackberry) to prevent obstruction of cave entrances. • Restrict access where possible to known maternity sites. (e.g.: signs; bat-friendly, preferably external gates at caves). • Restrict caving activity during critical times of year in important roosts used by species, particularly maternity and hibernation roosts. • Establish a gating design for disused mines across species range that will not adversely impact species. Consultation with cave bat specialist prior to any gating operations. • Determine the effectiveness of PVP assessment, offsets and actions for bats. • Monitor the breeding success of a representative sample of maternity colonies in cave roosts over a number of years to determine the viability of regional populations. • Regular censuses of maternity colonies (Wee Jasper, Bungonia, Willi-Willi, Riverton) and other key roosts in network, especially where there are population estimates from banding in the 1960s. • For roost caves vulnerable to human disturbance, monitor their visitation by people, particularly during winter and spring/summer maternity season and in school holidays. • Measure genetic population structure among cave roosts of maternity colonies to |

| Cave-dependent microbat species (Large-eared Pied Bat, Eastern Bent Wing Bat, Little Bent Wing Bat) | |
|---|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| | <p>estimate dispersal and genetic isolation, and vulnerability to regional population extinction.</p> <ul style="list-style-type: none"> • Research the effect of different burning regimes on cave disturbance and surrounding foraging habitat. • Control foxes and feral cats around roosting sites, particularly maternity caves and hibernation sites. • Study the ecological requirements of maternity colonies and their environs and migratory patterns. • Research to identify important foraging range and key habitat components around significant roosts. • Confirm species taxonomy of NSW populations, relative to other Australian populations. • Search for significant roost sites and restrict access where possible. Significant includes maternity, hibernation and transient sites including in artificial structures. . • Compile register of all known roost sites in natural and artificial structures including current and historical data and identify significance of roost, e.g. maternity, hibernation, transient roost. • Promote the conservation of these key roost areas using measures such as incentive funding to landholders, offsetting and biobanking, acquisition for reserve establishment or other means. • Prepare fire management plans for significant roost caves, disused mines, culverts, especially maternity and winter roosts. • Exclude prescription burns from 100m from cave entrance, ensure smoke/flames of fires do not enter caves/roosts in artificial structures. • Ensure protection of known roosts and forest within 10 km of roosts in PVP assessments (offsets should include nearby remnants in high productivity) and other environmental planning instruments. • Prepare management plans for significant bat roosts especially all known maternity colonies and winter colonies. • Restrict caving activities at significant roosts during important stages of the annual bat life cycle (eg winter hibernation, summer maternity season). • Identify and protect significant roost habitat in artificial structures (eg culverts, old buildings and derelict mines). • Identify the susceptibility of the species to pesticides. <p>Large-eared Pied Bat</p> <ul style="list-style-type: none"> • Ensure protection of caves and overhangs in area of suitable geology when undertaking PVP assessments (offsets should include nearby remnants in high productivity) or other land assessment tools. • Measure the genetic population structure among roosts of maternity colonies to estimate dispersal and genetic isolation, and thus vulnerability of regional populations to extinction. • Promote bats throughout the rural community as ecologically interesting and important, but sensitive to disturbance at caves/overhangs. • Control feral goats in rock overhangs and caves in the species range. • Identify important foraging range and key habitat components for this species. • Study the ecology, habitat requirements and population dynamics. • Determine suitable geology for roosting habitat for this species. • Implement key threat abatement actions for longwall mining. • Research the effect of different burning regimes. • Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees. • Identify the effects of fragmentation on the species in a range of fragmented landscapes such as the farmland/forest interface. For example movement and persistence across a range of fragment sizes. • Identify and protect roost habitat artificial structures (eg culverts, old buildings and derelict mines). • Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes. • Identify the susceptibility of the species to pesticides. • Undertake a targeted survey to determine distribution and status in parts of their range, such as the western edge of range. |

| Cave-dependent microbat species (Large-eared Pied Bat, Eastern Bent Wing Bat, Little Bent Wing Bat) | |
|--|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| | <ul style="list-style-type: none"> Determine location and attributes of maternity sites and restrict access where possible. (e.g. signage; bat-friendly, preferably external, gating of caves). Restrict access where possible to known maternity sites (e.g. signage; bat-friendly, preferably external, gating of caves). |
| g) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP | <p>The proposal may potentially constitute or promote a number of KTPs under the NSW TSC Act, as listed below. However, each of these processes are already in operation within the subject site and the proposal includes measures to reduce additional impacts from the proposal.</p> <ul style="list-style-type: none"> Clearing of native vegetation |
| <p>Conclusion: The proposed action is unlikely to have a significant impact on the cave dependent microbat species (Little Bent Wing Bat, Eastern Bent Wing Bat, Large-eared Pied Bat). The development will lead to the removal of a very small portion (<1%) of the available foraging habitat (1.284ha). The increased intensification will also affect only a minimal area of already affected habitat. Thus a Species Impact Statement is not required.</p> | |

| Hollow-dependent microbat species (Eastern False Pipistrelle, Eastern Freetail Bat, Yellow-bellied Sheathtail Bat, Greater Broad-nosed Bat) | |
|--|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| Background | |
| h) 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 | <p>The proposal will require the removal of 1.284 ha of foraging and roosting habitat including the loss of seven hollow bearing trees. However due to the presence of several thousand hectares of commensurate foraging habitat within the locality and the provision of nest boxes to offset the loss of hollows, the proposal is unlikely to affect the life cycle of threatened hollow dependent microbat species, such that, a local population is placed at risk of extinction.</p> <p>The proposed intensification of activities will lead to increased night-time noise, dust and light levels. However the area of habitat to be impacted is again negligible compared the available habitat and has already been subject to these impacts for more than 25 years. Overall it is considered that the action should not significantly impact on Hollow-dependent Bats.</p> |
| i) 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 | N/A |
| <p>j) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:</p> <p>xi. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</p> <p>xii. 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</p> | N/A |
| <p>k) In relation to the habitat of a threatened species, population or ecological community:</p> <p>xvi. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and</p> <p>xvii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and</p> | <p>Approximately 1.284 ha of already degraded habitat is proposed to be removed as a result of this proposal, including seven hollow bearing trees, which represents less than 1% of the available habitat in the study area.</p> <p>The proposal will result in minimal further fragmentation of a small area due to the construction of the new access road along an existing road route and the expanded stockpile will remove already relatively isolated vegetation. The high level of habitat connectivity adjacent to the study area and mobile nature of these species means that this activity is unlikely to significantly limit the dispersal ability of threatened hollow dependent bat species in the locality.</p> <p>The habitat proposed for removal is not considered to be important for the long term survival of hollow dependent bat species, as it is commensurate with several thousand hectares of other</p> |

| Hollow-dependent microbat species (Eastern False Pipistrelle, Eastern Freetail Bat, Yellow-bellied Sheathtail Bat, Greater Broad-nosed Bat) | |
|--|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| xviii. 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. | habitat within the locality and the hollow loss will be offset through the provision of nest boxes.. The increased intensification of activities and associated increase in light and noise is not expected to impact on the habitat of these species more than is already the case. |
| l) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly) | Under the TSC Act, the Director-General maintains a Register of critical habitat. |
| m) Whether the action proposed is consistent with the objectives or actions of a recovery plan or TAP | <p>No recovery plan has been prepared for this species. The following priority actions have been prepared:</p> <p>Eastern False Pipistrelle</p> <ul style="list-style-type: none"> • Ensure the largest hollow bearing trees (including dead trees) are given highest priority for retention in PVP assessments or other land assessment tools. • Develop and promote State-wide bat awareness programs for schools, CMAs, landholders and industry groups etc. • Research the effectiveness of rehabilitation measures intended to increase bat populations in degraded landscapes, such as revegetating and installing bat boxes. • Quantify any benefits to local bat populations from reducing the impact of insect pests on commercial crops. • Ensure the Code of Practice for private native forestry includes adequate measures to protect large, hollow-bearing trees and viable numbers of recruit trees. • Research the roosting ecology of tree-roosting bats. For example identifying the attributes of key roosts. • Research the degree of long-term fidelity to roost trees and roosting areas in order to assess their importance and the effects of their removal. • Identify important foraging range and key habitat components for this species. • Research the effect of different burning regimes. • Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees. • Investigate the effectiveness of logging prescriptions. • Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes. • Identify the effects of fragmentation in a range of fragmented landscapes e.g. cleared Tableland landscapes. For example genetic isolation, movement and persistence across a range of fragment sizes. • Study the ecology, habitat requirements and susceptibility to logging and other forestry practices of this little-known species. • Identify areas of private land that contain high densities of large hollow-bearing trees as areas of high conservation value (HCV) planning instruments and land management negotiations e.g. LEP, CAPs, PVPs. • Promote the conservation of these HCV private land areas using measures such as incentive funding to landholders, off-setting and biobanking, acquisition for reserve establishment or other means. <p>Eastern Freetail Bat</p> <ul style="list-style-type: none"> • Ensure the largest hollow bearing trees, inc. dead trees and paddock trees, are given highest priority for retention in PVP assessments. Offsets should include remnants in high productivity. • Develop and promote State-wide bat awareness programs for schools, CMAs, landholders and industry groups etc. • Research the effectiveness of rehabilitation measures intended to increase bat populations in degraded landscapes, such as revegetating and installing bat boxes. • Quantify any benefits of local bat populations to reducing the impact of insect pests on commercial crops. • Ensure the Code of Practice for private native forestry includes adequate measures to protect large, hollow-bearing trees and viable numbers of recruit trees. • Research the roosting ecology of tree-roosting bats. For example identifying the attributes of key roosts. • Research the degree of long-term fidelity to roost trees and roosting areas in order to assess their importance and the effects of their removal. • Identify important foraging range and key habitat components for this species. |

Hollow-dependent microbat species (Eastern False Pipistrelle, Eastern Freetail Bat, Yellow-bellied Sheathtail Bat, Greater Broad-nosed Bat)

Assessment of Significance criteria (Seven Part Test) Address of criteria

| | |
|--|---|
| | <ul style="list-style-type: none"> • Identify the susceptibility of the species to pesticides. • Better define species distribution through survey in coastal lowlands on- and off-reserve. • Research the effect of different burning regimes. • Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees. • Investigate the effectiveness of logging prescriptions. • Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes. • Identify the effects of fragmentation in a range of fragmented landscapes i.e. the farmland/forest interface and the urban/forest interface e.g. movement and persistence across a range of fragment sizes. • Study the ecology, habitat requirements and susceptibility to logging and other forestry practices of this little-known species. • Identify areas of private land that contain high densities of large hollow-bearing trees as areas of high conservation value planning instruments and land management negotiations e.g. LEP, CAPs, PVPs. • Promote the conservation of these private land areas using measures such as incentive funding to landholders, off-setting and biobanking, acquisition for reserve establishment or other means. <p>Yellow-bellied Sheathtail Bat</p> <ul style="list-style-type: none"> • Ensure the largest hollow bearing trees (including dead trees and paddock trees) are given highest priority for retention in PVP assessments and or other land assessment tools. • Research the effectiveness of rehabilitation measures intended to increase bat populations in degraded landscapes, such as revegetating and installing bat boxes. • Research to quantify any benefits of local bat populations to reducing the impact of insect pests on commercial crops. • Ensure the Code of Practice for private native forestry includes adequate measures to protect large, hollow-bearing trees and viable numbers of recruit trees. • Research the roosting ecology of tree-roosting bats. For example identifying the attributes of key roosts. • Research the degree of long-term fidelity to roost trees and roosting areas in order to assess their importance and the effects of their removal. • Use radio-tracking to identify important foraging range and help interpret density of records. • Raise awareness of the effects of pesticides. • Study the species biology such as reproductive capacity, longevity, mortality rate and life history, or thermal and energy requirements to better determine capacity to respond to changes in climate or recover from losses in the population. • Study the susceptibility of this species to pesticide accumulation. • Establish a community program to encourage the reporting of roost trees. • Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees. • Research the potential for long distance/seasonal movement. • Research the effect of different burning regimes. • Investigate the effectiveness of logging prescriptions. • Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes. • Identify the effects of fragmentation on the species in a range of fragmented landscapes. • Study the ecology, habitat requirements and susceptibility to logging and other forestry practices of this little-known species. • Identify areas of private land that contain high densities of large, hollow-bearing trees as areas of high conservation value planning instruments and land management negotiations e.g. LEP, CAPs, PVPs. • Promote the conservation of these HCV private land areas using measures such as incentive funding to landholders, off-setting and biobanking, acquisition for reserve establishment or other means. |
|--|---|

| Hollow-dependent microbat species (Eastern False Pipistrelle, Eastern Freetail Bat, Yellow-bellied Sheathtail Bat, Greater Broad-nosed Bat) | |
|---|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| | <ul style="list-style-type: none"> Develop and promote State-wide bat awareness programs for schools, CMAs, landholders and industry groups etc. <p>Greater Broad Nosed Bat</p> <ul style="list-style-type: none"> Ensure largest hollow bearing trees, inc. dead trees and paddock trees are given highest priority for retention in PVP assessments (offsets should include remnants in high productivity) and/or other land assessment tools. Research the effectiveness of rehabilitation measures intended to increase bat populations in degraded landscapes, such as revegetating riparian zones. Quantify any benefits of local bat populations to reducing the impact of insect pests on commercial crops. Ensure the Code of Practice for private native forestry includes adequate measures to protect large, hollow-bearing trees and viable numbers of recruit trees. Research the roosting ecology of tree-roosting bats. For example identifying the attributes of key roosts. Research the degree of long-term fidelity to roost trees and roosting areas in order to assess their importance and the effects of their removal. Identify important foraging range and key habitat components for this species. Undertake a systematic survey of productive coastal river valleys to quantify the importance of private land relative to public lands. Raise awareness of the effects of pesticides. Study the susceptibility of this species to pesticide accumulation. Research the effect of different burning regimes. Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees. Investigate the effectiveness of logging prescriptions. Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes. Identify the effects of fragmentation on the species in a range of fragmented landscapes, such as cleared coastal river valleys. For example movement and persistence across a range of fragment sizes. Study the ecology, habitat requirements and susceptibility to logging and other forestry practices of this little-known species. Identify areas of private land that contain high densities of large, hollow-bearing trees as areas of high conservation value in planning instruments and land management negotiations e.g. LEP, CAPs, PVPs. Promote the conservation of these HCV private land areas using measures such as incentive funding to landholders, off-setting and biobanking, acquisition for reserve establishment or other means. Develop and promote State-wide bat awareness programs for schools, CMAs, landholders and industry groups etc. <p>However none of the above actions directly relate to the proposal.</p> |
| n) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP | <p>The proposal may potentially constitute or promote a number of KTPs under the NSW TSC Act, as listed below. However, each of these processes are already in operation within the subject site and the proposal includes measures to reduce additional impacts from the proposal.</p> <ul style="list-style-type: none"> Clearing of native vegetation Competition from feral honeybees <i>Apis mellifera</i> Removal of dead wood and dead trees Loss of tree hollows |
| <p>Conclusion: The proposed action is unlikely to have a significant impact on threatened hollow dependent microbat species, as it will see the removal of only a small area of foraging habitat (1.284 ha) and the loss of hollows will be offset through the provision of nest boxes. The increased intensification will also affect only a very small area of already affected habitat. Therefore a Species Impact Statement is not required.</p> | |

2

| Little Lorikeet | |
|---|---------------------|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |

| Little Lorikeet | |
|--|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| Background | |
| 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 | <p>The proposal will require the removal of 1.284 ha of already degraded vegetation including seven hollow bearing trees. However due to the presence of several thousand hectares of commensurate foraging habitat within the locality and the provision of nest boxes to offset hollow loss, the proposal is unlikely to affect the life cycle of Little Lorikeet, such that, a local population is placed at risk of extinction.</p> <p>The proposed intensification of activities will lead to increased noise, dust and light levels. However the area of habitat to be impacted is again negligible compared the available habitat overall and is already subject to these impacts. Hence the action should not significantly impact on this species.</p> |
| 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 | N/A |
| c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: <ul style="list-style-type: none"> xiii. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or xiv. 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 | N/A |
| d) In relation to the habitat of a threatened species, population or ecological community: <ul style="list-style-type: none"> xix. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and xx. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and xxi. 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. | <p>Approximately 1.284 ha of habitat is proposed to be removed as a result of this proposal, representing less than 1% of the available habitat in the study area.</p> <p>The proposal will result in minimal further fragmentation of a small area due to the construction of a new access road along an existing road route and the expanded stockpile will remove already relatively isolated vegetation. The high level of habitat connectivity adjacent to the study area and mobility of this species mean that this activity is unlikely to significantly limit the dispersal ability of the Little Lorikeet in the locality.</p> <p>The habitat proposed for removal is not considered to be important for the long term survival of the Little Lorikeet, as it is commensurate with several thousand hectares of other habitat within the locality and the loss of seven hollow bearing trees will be offset through the emplacement of nest boxes..</p> <p>The increased intensification of activities with the associated increase in hours of light and noise is not expected to impact on the habitat of this species.</p> |
| e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly) | Under the TSC Act, the Director-General maintains a Register of critical habitat. |
| f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or TAP | No recovery plan has been prepared for this species. The following priority actions have been prepared: |
| g) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP | <p>The proposal may potentially constitute or promote a number of KTPs under the NSW TSC Act, as listed below. However, each of these processes are already in operation within the subject site and the proposal includes measures to reduce additional impacts from the proposal.</p> <ul style="list-style-type: none"> • Clearing of native vegetation • Competition from feral honeybees <i>Apis mellifera</i> • Removal of dead wood and dead trees • Loss of tree hollows |
| Conclusion: The proposed action is unlikely to have a significant impact on the Little Lorikeet, due to the removal of a relatively small area of potential habitat to be removed (1.284ha) and the increased intensification will also affect only a minimal area of already affected habitat. Thus a | |

| | |
|--|----------------------------|
| Little Lorikeet | |
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| Species Impact Statement is not required. | |

3

| | |
|---|---|
| Varied Sittella | |
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| Background | |
| 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 | <p>The proposal will require the removal of 1.284 ha of foraging habitat including seven hollow bearing trees. However due to the presence of several thousand hectares of commensurate foraging habitat within the locality and the provision of nest boxes, the proposal is unlikely to affect the life cycle of the Varied Sittella, such that, a local population is placed at risk of extinction.</p> <p>The proposed intensification of activities will lead to increased night-time noise, dust and light levels, however the area of habitat to be impacted is again negligible compared the available habitat overall, and is already impacted by the proposed activities. Hence the action should not significantly impact on the Varied Sittella.</p> |
| 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 | N/A |
| c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: <ul style="list-style-type: none"> xv. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or xvi. 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 | N/A |
| d) In relation to the habitat of a threatened species, population or ecological community: <ul style="list-style-type: none"> xxii. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and xxiii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and xxiv. 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. | <p>Approximately 1.284 ha of already degraded habitat is proposed to be removed as a result of this proposal, including seven hollow bearing trees, which represents less than 1% of the available habitat in the study area.</p> <p>The proposal will result in minimal further fragmentation of a small area due to the construction of a new access road along an existing road route and the expanded stockpile will remove already relatively isolated vegetation. The high level of habitat connectivity adjacent to the study area and mobile nature of this species means that this activity is unlikely to significantly limit the dispersal ability of the Varied Sittella in the locality.</p> <p>The habitat proposed for removal is not considered to be important for the long term survival of the Varied Sittella, as it is commensurate with several thousand hectares of other habitat within the locality.</p> <p>The increased intensification of activities with the associated increase in light and noise is not expected to impact on the habitat of this species</p> |
| e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly) | Under the TSC Act, the Director-General maintains a Register of critical habitat. As of 30 th May 2014, no critical habitat has been declared for the Varied Sittella. |
| f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or TAP | <p>No recovery plan has been prepared for this species. The following priority actions have been prepared:</p> <ul style="list-style-type: none"> • Encourage habitat linkages through PVP process. • Raise awareness about importance of microhabitats. Encourage retention of intact foraging and breeding habitat through PVP process. |

| Varied Sittella | |
|---|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| | However, the above recovery actions do not directly relate to the above proposal. |
| g) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP | <p>The proposal may potentially constitute or promote a number of KTPs under the NSW TSC Act, as listed below. However, each of these processes are already in operation within the subject site and the proposal includes measures to reduce additional impacts from the proposal.</p> <ul style="list-style-type: none"> • Clearing of native vegetation • Removal of dead wood and dead trees |
| <p>Conclusion: The proposed action is unlikely to have a significant impact on the Varied Sittella, due to the removal of a relatively small area of potential habitat (1.284 ha) and provision of nest boxes as hollow offsets. The increased intensification will also affect only a minimal area of already affected habitat. Therefore a Species Impact Statement is not required.</p> | |

4

| Stephen's Banded Snake | |
|--|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| Background | Stephens' Banded Snake is a medium-sized partly tree-dwelling snake up to one metre long. It is brown or yellow-brown above, with a series of irregular, broad, dark crossbands. The head is black with a brown crown and a brown or cream patch on either side of the nape and the lips are barred with black and cream. It occurs north from Gosford to the Queensland border and is a hollow-dependent species, being typically located in areas of forest with high densities of large hollows. |
| 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 | <p>The proposal will require the removal of 1.284 ha of already generally degraded potential foraging and denning habitat, including seven trees with hollows. However due to the presence of several thousand hectares of commensurate foraging habitat within the locality and the provision of nest boxes as offsets for the hollows, the proposal is unlikely to affect the life cycle of the Stephen's Banded Snake such that, a local population is placed at risk of extinction.</p> <p>The proposed intensification of activities will lead to increased night-time noise, dust and light levels. However the area of habitat to be impacted is again negligible compared the available habitat overall and the affected habitat has already been subject to these impacts for many years. So the action should not significantly impact on the Quoll.</p> |
| 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 | N/A |
| <p>c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:</p> <p>xvii. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</p> <p>xviii. 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</p> | N/A |
| <p>d) In relation to the habitat of a threatened species, population or ecological community:</p> <p>xxv. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and</p> <p>xxvi. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of</p> | <p>Approximately 1.284 ha of already degraded habitat is proposed to be removed as a result of this proposal, which represents less than 1% of the habitat available in the study area.</p> <p>The proposal will result in minimal further fragmentation of a small area due to the construction of a new access road along an existing road route and the expanded stockpile will remove already relatively isolated vegetation. Given that disturbances will be impact already impacted areas and the high level of habitat connectivity adjacent to the study area, this activity is unlikely to significantly alter the dispersal ability of the Stephens Banded Snake in the locality..</p> <p>The habitat proposed for removal is not considered to be important for the long term survival of the Stephens Banded Snake, as it is commensurate with several thousand hectares of other</p> |

| Stephen's Banded Snake | |
|---|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| xxvii. the proposed action, and 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. | habitat within the locality as only one larger hollow will be removed and will be mitigated through the placement of nest boxes. The increased intensification of activities with the associated increase in light and noise is not expected to impact on the habitat of this species |
| e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly) | Under the TSC Act, the Director-General maintains a Register of critical habitat. As at 30 th May 2014, no critical habitat has been declared for the Stephen's Banded Snake. |
| f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or TAP | No recovery plan has been prepared for this species. The following priority actions have been prepared: Develop models of preferred habitat. <ul style="list-style-type: none"> Determine Vegetation Associations. Reserve Fire management Strategy include operational guidelines to protect this species from fire. Develop a prescription for this species to be applied under relevant IFOAs. Investigate taxonomic or other differences between Northern and southern populations. Investigate ecological differences between Northern and Southern populations of the species. Establish a captive colony for breeding purposes in a number of facilities. Coordinate development and implementation of the recovery plans actions. Continue to assess the threats operating on the species and develop further recovery strategies as necessary. Monitor survey/study sites and assess any changes in measures of viability. Develop management strategies that protect, retain and perhaps augment stands of native vegetation, connectivity between stands and retain stags or hollow bearing trees. Develop a licensing policy on retaining this species in captivity under strict guidance. Design and implement an ecological burn (Dinner Creek) including habitat requirements of the species in Demon Nature Reserve. However none of the above recovery actions directly relate to the Stephen's Banded Snake. |
| g) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP | The proposal may potentially constitute or promote a number of KTPs under the NSW TSC Act, as listed below. However, each of these processes are already in operation within the subject site and the proposal includes measures to reduce additional impacts from the proposal. <ul style="list-style-type: none"> Clearing of native vegetation Competition from feral honeybees <i>Apis mellifera</i> Removal of dead wood and dead trees Loss of tree hollows |
| Conclusion: The proposed action is unlikely to have a significant impact on the Stephen's Banded Snake. This is because the development will lead to the removal of only a relatively small area of potential habitat (1.284ha) and loss of only one larger hollow that will be offset through the provision of nest boxes. The increased intensification will also affect only a small area of already affected habitat. Thus a Species Impact Statement is not required. | |

| Grey-headed Flying Fox | |
|--|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| Background | The Grey-headed Flying Fox is one of the largest flying foxes in the world and is Australia's only endemic species of flying fox. It has a distribution from southern Victoria to the wet tropics of Queensland. Grey-headed Flying Foxes roost in camps, which may at times support over 100,000 individuals. From these camps, individuals disperse each night, for a distance of up to 60km in search of flowering or fruiting trees or shrubs. |
| 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 | The proposal will require the removal of 1.284 ha of already generally degraded and/or fragmented foraging habitat. However due to the presence of several thousand hectares of commensurate foraging habitat within the locality, the proposal is unlikely to affect the life cycle of the Grey-headed Flying Fox, such that, a local population is placed at risk of extinction. The proposed intensification of activities will lead to increased night-time noise, dust and light |

| Grey-headed Flying Fox | |
|--|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| | levels, however the area of habitat to be impacted is again negligible compared the available habitat overall. The habitat is already subject to these impacts and the Flying Fox is known to be very tolerant of anthropogenic activities. Hence the action should not significantly impact on the Grey-headed Flying Fox. |
| 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 | N/A |
| c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: <p>xix. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</p> <p>xx. 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</p> | N/A |
| d) In relation to the habitat of a threatened species, population or ecological community: <p>xxviii. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and</p> <p>xxix. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and</p> <p>xxx. 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.</p> | <p>Approximately 1.284 ha of already degraded habitat is proposed to be removed as a result of this proposal.</p> <p>The proposal will result in minimal further fragmentation of a small area due to the construction of a new access road along an existing road route. However the high level of habitat connectivity adjacent to the study area and mobile nature of this species means that this activity is should not limit the dispersal ability of the Grey-headed Flying Fox in the locality.</p> <p>The habitat proposed for removal is not considered to be important for the long term survival of the Grey-headed Flying Fox as it is commensurate with several thousand hectares of other habitat within the locality. There are no known camps in the subject site or surrounds.</p> <p>The increased intensification of activities with the associated increase in light and noise is not expected to impact on the habitat or behaviour of this species.</p> |
| e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly) | Under the TSC Act, the Director-General maintains a Register of critical habitat. As of 30 th May 2014, no such habitat has been declared for the Grey-headed Flying Fox. |
| f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or TAP | <p>No final recovery plan has been prepared for this species. A draft recovery plan has been prepared dated 2009. However a number of priority action statements have been drafted after 2009, thus are considered to take precedence. These include:</p> <ul style="list-style-type: none"> • Set priorities for protecting foraging habitat critical to the survival of Grey-headed Flying-foxes and generate maps of priority foraging habitat. • Protect and enhance priority foraging habitat for Grey-headed Flying-foxes, for example through management plans, local environmental plans and development assessments, and through volunteer conservation programs for privately owned land. • Grey-headed Flying-fox National Recovery Team to undertake an annual review of the national recovery plan's implementation. • Increase the extent and viability of foraging habitat for Grey-headed Flying-foxes that is productive during winter and spring (generally times of food shortage), including habitat restoration/rehabilitation works. • Establish & maintain a range-wide database of Grey-headed Flying-fox camps, including information on location, tenure, zoning & history of use, for distribution to land management/planning authorities, researchers & interested public. • Improve knowledge of Grey-headed Flying-fox camp locations, targeting regional areas and seasons where information is notably incomplete, such as inland areas during spring and summer. |

| Grey-headed Flying Fox | |
|--|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| | <ul style="list-style-type: none"> • Protect roosting habitat critical to the survival of Grey-headed Flying-foxes, for example through management plans, local environmental plans and development assessments, and through volunteer conservation programs for privately owned land. • Determine characteristics of roosting habitat for Grey-headed Flying-foxes, exploring the roles of floristic composition, vegetation structure, microclimate and landscape features, and assess the status of camps. • Enhance and sustain the vegetation of camps critical to the survival of Grey-headed Flying-foxes. • Develop and promote incentives to reduce killing of flying-foxes in commercial fruit crops. • Identify the commercial fruit industries that are impacted by Grey-headed Flying-foxes, to provide an information base for use by the various stakeholders. • Systematically document the levels of flying-fox damage to the horticulture industry within the range of the Grey-headed Flying-fox. • Develop methods for rapid estimates of flying-fox damage on commercial crops, allowing the long-term monitoring of industry-wide levels and patterns of flying-fox damage. • Develop and implement a grower-based program to monitor trends in damage to commercial fruit crops by flying-foxes, and use the results to monitor the performance of actions to reduce crop damage. • Develop methods to monitor landscape scale nectar availability trends, to explain/potentially predict crop damage trends where crop protection is absent, & promote importance of foraging habitat productive in seasons critical to the horticulture industry. • Describe the species, age structure & demographics of flying-foxes killed in fruit crops to improve the understanding of the impact by assessing trends in the species, sex, age & reproductive status of animals killed on crops. • Review & evaluate camp site management activities, summarising outcomes of past experiences at controversial camps. Noise impacts on neighbours of camps to be considered. For use in managing future conflicts with humans at flying-fox camps. • Develop guidelines to assist land managers dealing with controversial flying-fox camps. • Develop materials for public education & provide them to land managers & local community groups working with controversial flying-fox camps, highlighting species status, reasons for being in urban areas, reasons for decline etc. • Assess the impacts Grey-headed Flying-fox camps have on water quality, and publish results in a peer-reviewed journal. • Provide educational resources to improve public attitudes toward Grey-headed Flying-foxes. • Monitor public attitudes towards flying-foxes. • Review and improve methods used to assess population size of Grey-headed Flying-foxes. • Conduct periodic range-wide assessments of the population size of Grey-headed Flying-foxes to monitor population trends. • Assess the impacts on Grey-headed Flying-foxes of electrocution on powerlines and entanglement in netting and barbed wire, and implement strategies to reduce these impacts. • Investigate the differences in genetic relatedness, sex, age etc. between sedentary and transient Grey-headed Flying-foxes. • Investigate between-year fidelity of Grey-headed Flying-fox individuals to seasonal camps. • Investigate the genetic structure within Grey-headed Flying-fox camps, including levels of relatedness within and between members of adult groups, occupants of individual trees etc. • Investigate the patterns of juvenile Grey-headed Flying-fox dispersal and mortality, allowing identification of the specific habitat requirements of juveniles. • Investigate the age structure and longevity of Grey-headed Flying-foxes. • Complete national recovery plan. <p>None of the above actions directly relate to the above proposal.</p> |
| g) Whether the action proposed constitutes or is part of a KTP or is likely to result in the | The proposal may potentially constitute or promote a number of KTPs under the NSW TSC Act, as listed below. However, each of these processes are already in operation within the |

| Grey-headed Flying Fox | |
|---|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| operation of, or increase the impact of, a KTP | <p>subject site and the proposal includes measures to reduce additional impacts from the proposal.</p> <ul style="list-style-type: none"> • Clearing of native vegetation • Competition from feral honeybees <i>Apis mellifera</i> • Removal of dead wood and dead trees • Loss of tree hollows |
| <p>Conclusion: The proposed action is unlikely to have a significant impact on the Grey-headed Flying Fox. This is because the proposal requires the removal of only a relatively small area of potential habitat (1.284ha) and the proposed increased intensification will also affect only a minimal area of already degraded habitat. Therefore a Species Impact Statement is not required.</p> | |

| Eastern Underground Orchid | |
|--|--|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| Background | <p>The Eastern Underground Orchid (<i>Rhizanthella slateri</i>) is an orchid with a whitish, fleshy underground stem to 15 cm long and 15 mm diameter. The flowering heads mature below the soil surface or may extend to 2 cm above the ground. Each flower head has up to 30, tubular, purplish flowers. It occurs from south-east Queensland to south-east NSW and, in NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Its habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. It flowers September to November.</p> |
| h) 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 | <p>The proposal will require the removal of 1.284 ha of habitat. Given the uncertainty of the habitat requirements of this species, its presence cannot be discounted with any certainty and the few known locations and small populations indicate that the disturbance could put a local population at risk of extinction.</p> |
| i) 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 | N/A |
| <p>j) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:</p> <p>xxi. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</p> <p>xxii. 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</p> | N/A |
| <p>k) In relation to the habitat of a threatened species, population or ecological community:</p> <p>xxx. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and</p> <p>xxxii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and</p> <p>xxxiii. The importance of the habitat to be</p> | <p>Approximately 1.284 ha of habitat is proposed to be removed as a result of this proposal. The proposal will result in increased fragmentation in a small area due to the construction of a new access road. However due to the level of habitat connectivity adjacent to the study area, this activity is unlikely to significantly limit the dispersal ability of the Eastern Underground Orchid in the locality.</p> <p>The habitat proposed for removal may be important for the long term survival of the Eastern Underground Orchid. The habitat is commensurate with several thousand hectares of other habitat within the locality and so may represent only a small portion of the habitat of the population, but the presence of the species at less than 10 small, isolated populations within NSW means that even a small area may contain an important population for this species.</p> |

| Eastern Underground Orchid | |
|---|---|
| Assessment of Significance criteria (Seven Part Test) | Address of criteria |
| removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality. | |
| l) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly) | Under the TSC Act, the Director-General maintains a Register of critical habitat. As of 30 th May 2014, no such habitat has been declared for the Eastern Underground Orchid. |
| m) Whether the action proposed is consistent with the objectives or actions of a recovery plan or TAP | No final recovery plan has been prepared for this species. However three priority action statements have been drafted: <ul style="list-style-type: none"> • Site specific management of the Bulahdelah population • Site specific management of a Translocation Site • Protect areas of known habitat from clearing The third point may have relevance to this site based on assumed presence at this time. |
| n) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP | The proposal may potentially constitute or promote a number of KTPs under the NSW TSC Act, as listed below. However, each of these processes are already in operation within the subject site and the proposal includes measures to reduce additional impacts from the proposal. <ul style="list-style-type: none"> • Clearing of native vegetation • Competition from feral honeybees <i>Apis mellifera</i> • Removal of dead wood and dead trees • Loss of tree hollows |
| Conclusion: Until appropriate surveys can be undertaken to determine that the Eastern Underground Orchid is absent from the site, its presence must be assumed. Given the small number of isolated sites known for this species in NSW it is concluded that the loss of 1.284ha of habitat could have a significant impact on this species. Therefore a Species Impact Statement or other form of mitigation will be required unless the species can be determined to be absent. | |

EPBC Assessments of Significance for species considered as having potential habitat within the project area

| Koala | | |
|---|---|-------------------|
| Criteria (Vulnerable Species) | Address of Criteria | Likelihood |
| An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will: | | |
| <ul style="list-style-type: none"> lead to a long-term decrease in the size of an important population of a species | Koalas have not been recorded from the subject site, however are known to occur in low densities in the broader locality (i.e. Talawahl Nature Reserve). The habitat that is proposed to be removed contains Grey Gum (<i>Eucalyptus propinqua</i>), a species used by Koalas. The removal of 1.284 ha of habitat represents a very small proportion of potential Koala habitat within the wider locality, thus is unlikely to result in a long-term decrease in size of an important Koala population. | Unlikely |
| <ul style="list-style-type: none"> reduce the area of occupancy of an important population | While the subject site contains potential Koala habitat, Koalas are not known to use the subject site or surrounding vegetation. It is therefore unlikely that the proposed action will reduce the area of occupancy of an important population of the Koala. | Unlikely |
| <ul style="list-style-type: none"> fragment an existing important population into two or more populations | Habitat connectivity will be maintained surrounding the subject site, thus it is unlikely that the proposed action would fragment an existing population into two or more populations. | Unlikely |
| <ul style="list-style-type: none"> adversely affect habitat critical to the survival of a species | No Koalas are known to occur in the subject site or surrounding habitat. Thus it is unlikely that the proposed action would adversely affect habitat critical to the survival of the Koala. | Unlikely |
| <ul style="list-style-type: none"> disrupt the breeding cycle of an important population | No Koalas are known to breed within the subject site or surrounding habitat. Thus it is unlikely that the proposed action would disrupt the breeding cycle of the Koala | Unlikely |
| <ul style="list-style-type: none"> modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline | The proposal will remove 1.284 ha of potential Koala habitat. However due to the occurrence of over 3000 ha of Grey Gum dominated forest within a 5km radius of the subject site, it is unlikely that the proposal will cause a decline in the local Koala population. Similarly, the proposed increased intensification will also affect only a minimal area of already affected habitat and so again will be unlikely to cause any decline in the local population. | Unlikely |
| <ul style="list-style-type: none"> result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat | The Environmental Management Plan will continue to be implemented for the project, where invasive weed species are actively managed throughout the life of the project. Therefore it is considered unlikely that any invasive species will become established within the habitat of the Koala. | Unlikely |
| CONCLUSION | Due to the removal of only a small area (1.284ha) of habitat that is not critical to the survival of the Koala in the NSW Mid North Coast area, and the absence of a Koala population on the site, a significant impact on the Koala is not considered to be likely. | |

| Large-eared Pied Bat | | |
|--|---|-------------------|
| Criteria (Vulnerable Species) | Address of Criteria | Likelihood |
| An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will: | | |
| <ul style="list-style-type: none"> lead to a long-term decrease in the size of an important population of a species | Potential foraging habitat for the Large-eared Pied Bat occurs within the subject site. Up to 1.284 ha of foraging habitat will be removed by this proposal. However as the proposal is not located adjacent to any suitable roosting habitat for the species, it is unlikely that the proposal will lead to a long term decline of the Large-eared Pied Bat. | Unlikely |
| <ul style="list-style-type: none"> reduce the area of occupancy of an important population | The removal of 1.284 ha of potential foraging habitat when over 3000 ha of commensurate habitat occurs within a 5km radius of the subject site, is unlikely to lead to a long-term decrease in the size of the Large-eared Pied Bat population. Similarly any increased noise and light resulting from increased hours of operation will affect only a small percentage of the available habitat that is already subject to some degree to the same impacts, albeit for a lesser period of time. Therefore is it unlikely to lead to a long-term decrease in the size of the Large-eared Pied Bat population. | Unlikely |
| <ul style="list-style-type: none"> reduce the area of occupancy of an important population | The removal of 1.284 ha of potential foraging habitat when over 3000 ha of commensurate habitat occurs within a 5km radius of the subject | Unlikely |

| | | |
|---|---|----------|
| | site, is unlikely to lead to a reduction in the area of occupancy of the Large-eared Pied Bat. | |
| <ul style="list-style-type: none"> fragment an existing important population into two or more populations | The removal of 1.284 ha of potential foraging habitat when over 3000 ha of commensurate habitat occurs within a 5km radius of the subject site, is unlikely to lead fragment the existing population into two or more populations. | Unlikely |
| <ul style="list-style-type: none"> adversely affect habitat critical to the survival of a species | As the proposal will not impact upon any roosting habitat (i.e. sandstone caves), it is unlikely to affect habitat critical to the survival of the Large-eared Pied Bat. | Unlikely |
| <ul style="list-style-type: none"> disrupt the breeding cycle of an important population | As the proposal will not impact upon any roosting habitat (i.e. sandstone caves), it is unlikely to affect the breeding cycle of the Large-eared Pied Bat. | Unlikely |
| <ul style="list-style-type: none"> modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline | As the proposal will not impact upon any roosting habitat (i.e. sandstone caves), the removal of 1.284 ha of foraging habitat is unlikely to result in a decline of the Large-eared Pied Bat. | Unlikely |
| <ul style="list-style-type: none"> result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat | The Environmental Management Plan will continue to be implemented for the project, where invasive weed species are actively managed throughout the life of the project. Therefore it is considered unlikely that any invasive species will become established within the habitat of the Large-eared Pied Bat. | Unlikely |
| CONCLUSION | Due to the removal of only a small (1.284ha) area of foraging habitat and no disturbance to any known roosts or the presence of any potential roosts nearby, a significant impact on the Large-eared Pied Bat is considered unlikely. | |

| Spotted-tail Quoll (Endangered Species) | | |
|---|---|-------------------|
| Criteria (Endangered Species) | Address of Criteria | Likelihood |
| An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will: | | |
| <ul style="list-style-type: none"> lead to a long-term decrease in the size of a population of a species | The removal of 1.284 ha of potential foraging habitat when over 3000 ha of commensurate habitat occurs within a 5km radius of the subject site, is unlikely to lead to a long-term decrease in the size of the Spotted-tail Quoll population. Similarly any increased noise and light resulting from increased hours of operation will affect only a small percentage of the available habitat that is already subject to the same impacts, albeit for a lesser period of time. Therefore is it unlikely to lead to a long-term decrease in the size of the Spotted-tail Quoll. | Unlikely |
| <ul style="list-style-type: none"> reduce the area of occupancy of a population | The removal of 1.284 ha of potential foraging habitat when over 3000 ha of commensurate habitat occurs within a 5km radius of the subject site, is unlikely to lead to a long-term decrease in the area of occupancy of the Spotted-tail Quoll population. | Unlikely |
| <ul style="list-style-type: none"> fragment an existing population into two or more populations | The removal of 1.284 ha of potential foraging habitat when over 3000 ha of commensurate habitat occurs within a 5km radius of the subject site, is unlikely to lead fragment the existing population into two or more populations. | Unlikely |
| <ul style="list-style-type: none"> adversely affect habitat critical to the survival of a species | The removal of 1.284 ha of potential foraging habitat when over 3000 ha of commensurate habitat occurs within a 5km radius of the subject site, is unlikely to constitute habitat critical to the survival of the Spotted-tail Quoll population. | Unlikely |
| <ul style="list-style-type: none"> disrupt the breeding cycle of a population | The removal of 1.284 ha of potential foraging habitat when over 3000 ha of commensurate habitat occurs within a 5km radius of the subject site, is unlikely to disrupt the breeding cycle of the Spotted-tail Quoll population. Similarly any increased noise and light resulting from increased hours of operation will affect only a small percentage of the available habitat that is already subject to the same impacts, albeit for a lesser period of time. Therefore is it unlikely to lead to a long-term decrease in the size of the Spotted-tail Quoll. | Unlikely |
| <ul style="list-style-type: none"> modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline | The removal of 1.284 ha of potential foraging habitat when over 3000 ha of commensurate habitat occurs within a 5km radius of the subject site, is unlikely to lead to a decline in the Spotted-tail Quoll population. Similarly any increased noise and light resulting from increased hours | Unlikely |

| | | |
|--|---|----------|
| | of operation will affect only a small percentage of the available habitat that is already subject to the same impacts, albeit for a lesser period of time. Therefore is it unlikely to lead to a long-term decrease in the size of the Spotted-tail Quoll. | |
| <ul style="list-style-type: none"> result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat | The Environmental Management Plan will continue to be implemented for the project, where invasive weed species are actively managed throughout the life of the project. Therefore it is considered unlikely that any invasive species will become established within the habitat of the Spotted-tail Quoll. | Unlikely |
| CONCLUSION | The removal of 1.284ha of habitat for the Spotted-tail Quoll is considered unlikely to constitute a significant impact on the species due to the large-home range of the species. | |

| Grey-headed Flying Fox | | |
|---|--|------------|
| Criteria (Vulnerable Species) | Address of Criteria | Likelihood |
| An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will: | | |
| <ul style="list-style-type: none"> lead to a long-term decrease in the size of an important population of a species | <p>No Grey-headed Flying Fox camps are located within or adjacent to the subject site. The proposal will remove 1.284 ha of foraging habitat for the species, however over 3000 ha of commensurate habitat occurs within a 5km radius. Therefore the proposal is unlikely to lead to a long-term decrease in the size of the local Grey-headed Flying Fox population.</p> <p>Similarly any increased noise and light resulting from increased hours of operation will affect only a small percentage of the available habitat that is already subject to the same impacts, albeit for a lesser period of time. Therefore is it unlikely to lead to a long-term decrease in the size of the Grey-headed Flying Fox population. This species is also well know for its adaptability to urban environments and is clearly able to handle well anthropogenic noises.</p> | Unlikely |
| <ul style="list-style-type: none"> reduce the area of occupancy of an important population | No Grey-headed Flying Fox camps are located within or adjacent to the subject site. The proposal will remove 1.284 ha of foraging habitat for the species, however over 3000 ha of commensurate habitat occurs within a 5km radius. | Unlikely |
| <ul style="list-style-type: none"> fragment an existing important population into two or more populations | No Grey-headed Flying Fox camps are located within or adjacent to the subject site. The proposal will remove 1.284 ha of foraging habitat for the species, however over 3000 ha of commensurate habitat occurs within a 5km radius. Thus it is unlikely that the proposal will fragment the existing Grey-headed Flying Fox population into two or more populations, especially given the highly mobile nature of this species. | Unlikely |
| <ul style="list-style-type: none"> adversely affect habitat critical to the survival of a species | No Grey-headed Flying Fox camps will be impacted by this proposal. Therefore the proposal will not adversely affect habitat critical to the survival of the Grey-headed Flying Fox population. | Unlikely |
| <ul style="list-style-type: none"> disrupt the breeding cycle of an important population | No Grey-headed Flying Fox camps will be impacted by this proposal. Therefore the proposal will not disrupt the breeding cycle of the Grey-headed Flying Fox population. | Unlikely |
| <ul style="list-style-type: none"> modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline | No Grey-headed Flying Fox camps are located within or adjacent to the subject site. The proposal will remove 1.284 ha of foraging habitat for the species, however over 3000 ha of commensurate habitat occurs within a 5km radius. Similarly any increased noise and light resulting from increased hours of operation will affect only a small percentage of the available habitat that is already subject to the same impacts, albeit for a lesser period of time. Thus it is unlikely that the proposal cause the Grey-headed Flying Fox population to decline. | Unlikely |
| <ul style="list-style-type: none"> result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat | The Environmental Management Plan will continue to be implemented for the project, where invasive weed species are actively managed throughout the life of the project. Therefore it is considered unlikely that any invasive species will become established within the habitat of the Grey-headed Flying Fox | Unlikely |
| CONCLUSION | Due to the removal of a small area (1.284ha) of potential foraging habitat and the subject site being several kilometres from any known Grey-headed Flying Fox camps, the proposal is unlikely to result in a | |

| | | |
|---|--|-------------------|
| | significant impact on the Grey-headed Flying Fox population. | |
| Eastern Underground Orchid | | |
| Criteria (Vulnerable Species) | Address of Criteria | Likelihood |
| An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will: | | |
| <ul style="list-style-type: none"> lead to a long-term decrease in the size of an important population of a species | This species is assumed present on the site at this time due to a lack of suitable surveys to confirm its absence. The proposal will remove 1.284 ha of potential habitat for the species and could lead to a long-term decrease in the size of the local Eastern Underground Orchid population. This is based on the fact that the species is known only from fewer than 10 small, isolated populations within NSW. Hence any population is important and the loss of even a small area could lead to a significant impact. | Possible |
| <ul style="list-style-type: none"> reduce the area of occupancy of an important population | The proposal will remove 1.284 ha of potential habitat for the species and could lead to a long-term decrease in the size of the local Eastern Underground Orchid population. This is based on the fact that the species is known only from fewer than 10 small, isolated populations within NSW. Hence any population is important and the loss of even a small area could lead to a significant impact. | Possible |
| <ul style="list-style-type: none"> fragment an existing important population into two or more populations | The assumed presence of the species on the site would form a new population. It is not known if the activity would result in a split of an important population. | Possible |
| <ul style="list-style-type: none"> adversely affect habitat critical to the survival of a species | The species is known only from fewer than 10 small, isolated populations within NSW. Hence any population is important and the loss of even a small area could adversely affect the survival of the species. | Possible |
| <ul style="list-style-type: none"> disrupt the breeding cycle of an important population | The species is known only from fewer than 10 small, isolated populations within NSW. Hence any population is important and the removal of habitat would disrupt the breeding of an important population, if present. | Possible |
| <ul style="list-style-type: none"> modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline | The proposal will remove 1.284 ha of potential habitat for the species and could lead to a long-term decrease in the size of the local Eastern Underground Orchid population. This is based on the fact that the species is known only from fewer than 10 small, isolated populations within NSW. Hence any population is important and the loss of even a small area would likely lead to a significant impact. | Possible |
| <ul style="list-style-type: none"> result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat | The Environmental Management Plan will continue to be implemented for the project, where invasive weed species are actively managed throughout the life of the project. Therefore it is considered unlikely that any invasive species will become established within the habitat of the Eastern Underground Orchid | Possible |
| CONCLUSION | The proposal will remove only 1.284 ha of potential habitat for the species. However, this could lead to a long-term decrease in the size of the local Eastern Underground Orchid population. This is based on the fact that the species is known only from fewer than 10 small, isolated populations within NSW. Until it can be established that the Eastern Underground Orchid is absent from the proposed development site, it is assumed that the action can have a significant impact on the Eastern Underground Orchid. | |

Appendix 3: Staff CVs

| | | | | | | | | | | | | | |
|--|--|--------------|---|-----------|--|---------|---|---------|--|------|--|-----------|--|
| <p>Professional Memberships</p> | <ul style="list-style-type: none"> • Australian Society of Herpetologists (President) • NSW Declining Frogs Working Group (Secretary) • Royal Zoological Society of NSW • American Society of Ichthyologists and Herpetologists | | | | | | | | | | | | |
| <p>Qualifications</p> | <ul style="list-style-type: none"> • Bachelor of Science - University of Sydney • Masters of Science (Zoology) - University of the Sydney • Doctor of Philosophy (Zoology) - University of Newcastle (NSW) | | | | | | | | | | | | |
| <p>Employment History</p> | <table border="0"> <tr> <td>2011-present</td> <td>Team Leader - Ecology, Niche Environment and Heritage Pty Ltd</td> </tr> <tr> <td>1995-2011</td> <td>Research Scientist, State Forests of NSW</td> </tr> <tr> <td>1993-95</td> <td>Scientific Officer, NSW Forestry Commission</td> </tr> <tr> <td>1992-93</td> <td>Technical Officer, NSW Forestry Commission</td> </tr> <tr> <td>1992</td> <td>Technical Officer, NSW National Parks and Wildlife Service</td> </tr> <tr> <td>1987-1991</td> <td>Demonstrator, School of Biological Sciences University of Sydney</td> </tr> </table> | 2011-present | Team Leader - Ecology, Niche Environment and Heritage Pty Ltd | 1995-2011 | Research Scientist, State Forests of NSW | 1993-95 | Scientific Officer, NSW Forestry Commission | 1992-93 | Technical Officer, NSW Forestry Commission | 1992 | Technical Officer, NSW National Parks and Wildlife Service | 1987-1991 | Demonstrator, School of Biological Sciences University of Sydney |
| 2011-present | Team Leader - Ecology, Niche Environment and Heritage Pty Ltd | | | | | | | | | | | | |
| 1995-2011 | Research Scientist, State Forests of NSW | | | | | | | | | | | | |
| 1993-95 | Scientific Officer, NSW Forestry Commission | | | | | | | | | | | | |
| 1992-93 | Technical Officer, NSW Forestry Commission | | | | | | | | | | | | |
| 1992 | Technical Officer, NSW National Parks and Wildlife Service | | | | | | | | | | | | |
| 1987-1991 | Demonstrator, School of Biological Sciences University of Sydney | | | | | | | | | | | | |
| <p>Career Overview</p> | <p>Frank has been a professional scientist since 1992, specialising in the ecology and management of frogs and the management of threatened species. Frank has conducted ecological work throughout eastern Australia (NSW, Victoria, Queensland) establishing long-term research and monitoring programs into the management of forest fauna and developing strategies to mitigate the impacts of human disturbances on threatened fauna. He has worked extensively with the NSW state and Federal Governments on varying issues of fauna management and written reports and recovery plans. He is experienced in the application of state and federal legislation which relates to the conservation of threatened species and communities, having been directly involved in the assessment of major Environmental Impact Statements and Fauna Impact Assessment.</p> <p>Frank also has a long and ongoing interest in education and wildlife training, heading the Forests NSW Wildlife School Training Program, which he continues at Niche. He organises and coordinates all of the courses as well as providing large elements of the teaching program. He continues to have regular involvement in teaching senior biology students at several Universities.</p> <p>Frank has been the author on over 100 scientific publications and reports including invited authorship for chapters in international book series. He has also undertaken more than 50 presentations at National and International conferences.</p> <p>As the project manager for both large and small projects, Frank has been required to develop methodology, co-ordinate multi disciplined field teams, prepare reports incorporating results from several disciplines and maintain effective communication with the client and various regulatory and/or public authorities.</p> | | | | | | | | | | | | |
| <p>Professional Vision</p> | <p>To significantly contribute to the sustainable management of Australia's natural resources and promote a greater awareness and understanding of the unique natural history of this country. To provide scientifically based and sound advice on the management of fauna to ensure the survival of our fauna and flora whilst allowing continued use of Australia's natural resources.</p> | | | | | | | | | | | | |
| <p>Skills</p> | <ul style="list-style-type: none"> • Ecological surveys, assessment and monitoring • Herpetology • Project management • Environmental approvals • Expert witness and peer review • Government agency consultation and advocacy • Impact minimisation (mitigation) • Leadership in education course development and management • Post-graduate Student Supervision | | | | | | | | | | | | |

Key achievements/ flagship projects

Pacific Highway Upgrades: Karuah to Coolongoolook, 1997-Current

Frank has been the scientist that has developed investigations into the management of the Green-thighed Frog along this section of the Pacific Highway. He coordinated a major study of the species in the region and provided advice on specific management strategies. He has maintained an ongoing monitoring program of the species leading to further refinements in their management and assessments of success of the mitigation works.

Princess Highway Upgrades: South Nowra 2011 - Current

Frank has been involved in the recent survey and assessments of the impact of this Upgrade on the Green and Golden Bell Frog that has been located along the Upgrade. Frank was directly involved in the writing of the EPBC and EP&A/TSC Act assessments, an EPBC Referral and is assisting in the development of suitable mitigation works and monitoring to manage the ongoing works.

Princess Highway Upgrades: Gerringong 2011 - Current

Frank has been involved in the recent survey and assessments of the impact of this Upgrade on the Green and Golden Bell Frog and the Fishing Bat and has written a management plan for the bat to assist in its translocation from a bridge that is to be removed. He is also part of the ongoing monitoring of this species.

Fauna Assessment for Painting of Bridges over the Hume Highway: 2011

Frank provided the planning, survey and reporting for the impacts of proposed re-painting of the Uningalla and Narambulla Bridges located on the Hume Highway near Marula in the Southern Highlands of NSW.

Forests NSW Environmental Impact Statements, 1991-95

Frank oversaw the writing and review of numerous Environmental Impact Statements and the associated Fauna Impact Statement prepared to cover all of the major forestry areas of NSW. This work required Frank to liaise with various Government Departments and experts in the field of fauna management and prepare reviews of all documentation to ensure that statutory and legal requirements were met. He also ensured that the best available scientific information was used to complete the assessments.

Forests NSW Fauna Monitoring Strategy, 2008-2011

Frank assisted in the development of the broad-scale fauna monitoring program being implemented by Forests NSW across its entire estate. In particular, he developed ideas on alternative strategies to monitor frogs and undertook the pilot program for reptile monitoring in the Pilliga Forests of northwest NSW.

Western NSW Biodiversity Surveys, 2004-2011

Frank planned, lead and undertook surveys of various areas of far western NSW under contracts with the Australian Biological Resources Study. The surveys targeted areas of remnant vegetation and reserves to provide information on the distribution of fauna in this little surveyed region. Areas covered included Broken Hill, White Cliffs, Ivanhoe, Condobolin, Nyngan, Bourke and Menindee Lakes.

Selected Papers

Lemckert, F.L., Hecnar S.J., & Pilliod, D.S. 2012. Habitat Destruction and Modification. In *Biology of the Amphibia Volume 10: Conservation and Decline of Amphibians: Ecology, Effects of Humans, and Management*. H. Heatwole (Ed.). Surrey-Beattey and Sons, Sydney.

Lemckert, F.L. 2011 Managing pond breeding anurans in the selectively harvested forests of coastal New South Wales, Australia. *Forest Ecology and Management* 262:1199-1204.

Lemckert, F.L., Penman, T. & Haywood, A. 2011. Adaptive monitoring using the endangered northern corroboree frog (*Pseudophryne pengilleyi*) as a case study. *Proceedings of the International Academy of Ecology and Environmental Sciences* 1:87-96.

Lemckert, F., Rosauer D. & Slatyer, C. 2009. A comparison of Australia's anuran records against the reserve system. *Biodiversity and Conservation* 18:1233-1246.

| | | | | | | | | | | | | | |
|--------------------------|--|--------------|--|-----------|-------------------------------|---------|--|---------|---|-----------|-----------------------------|---------|--|
| Professional Memberships | <ul style="list-style-type: none"> • Australian Mammal Society | | | | | | | | | | | | |
| Qualifications | <ul style="list-style-type: none"> • Bachelor of Science (Environmental Biology) - University of Technology Sydney • BioBanking Assessors Course - Ryde TAFE • Planning for Bushfire Protection - University of Technology Sydney | | | | | | | | | | | | |
| Employment History | <table border="0"> <tr> <td>2012-present</td> <td>Senior Ecologist, Niche Environment and Heritage Pty Ltd</td> </tr> <tr> <td>2010-2012</td> <td>Senior Ecologist, GHD Pty Ltd</td> </tr> <tr> <td>2003-10</td> <td>Manager/Principal Ecologist, Ecovision Consulting.</td> </tr> <tr> <td>2001-03</td> <td>Ecologist, HLA-Envirosciences Pty Limited</td> </tr> <tr> <td>1999-2000</td> <td>Ecologist, Conacher Travers</td> </tr> <tr> <td>1996-98</td> <td>Manager/ Ecologist, Ecovision Consulting</td> </tr> </table> | 2012-present | Senior Ecologist, Niche Environment and Heritage Pty Ltd | 2010-2012 | Senior Ecologist, GHD Pty Ltd | 2003-10 | Manager/Principal Ecologist, Ecovision Consulting. | 2001-03 | Ecologist, HLA-Envirosciences Pty Limited | 1999-2000 | Ecologist, Conacher Travers | 1996-98 | Manager/ Ecologist, Ecovision Consulting |
| 2012-present | Senior Ecologist, Niche Environment and Heritage Pty Ltd | | | | | | | | | | | | |
| 2010-2012 | Senior Ecologist, GHD Pty Ltd | | | | | | | | | | | | |
| 2003-10 | Manager/Principal Ecologist, Ecovision Consulting. | | | | | | | | | | | | |
| 2001-03 | Ecologist, HLA-Envirosciences Pty Limited | | | | | | | | | | | | |
| 1999-2000 | Ecologist, Conacher Travers | | | | | | | | | | | | |
| 1996-98 | Manager/ Ecologist, Ecovision Consulting | | | | | | | | | | | | |
| Career Overview | <p>Mark has been a professional ecological consultant for over 18 years with experience in terrestrial and aquatic wildlife ecology. He has experience in the design and implementation of flora and fauna surveys, impact assessment, biodiversity offsetting, monitoring projects and the project management of environmental approvals projects. He is an accredited assessor under the NSW BioBanking Offsets Scheme.</p> <p>Mark is experienced in the collection and analysis of complex ecological datasets (i.e. flora, fauna and aquatic biota) for impact assessments and natural resource management. Experience includes the design and implementation of seasonal baseline surveys involving standard and non-standard survey techniques for small to large sized projects. Analytical experience includes the use of statistics (i.e. parametric and non-parametric techniques) for data classification (e.g. vegetation communities), analysis of environmental factors (e.g. ecosystems dependency on groundwater resources) and hypothesis testing (e.g. comparing biological populations).</p> <p>Mark has used these skills to define project opportunities and constraints and to develop solutions critical to the delivery of mining, infrastructure and land development projects which minimise biodiversity impacts. Mark's working based experience in the principles of impact avoidance, mitigation and offsetting forms a solid foundation to his involvement in complex and or large projects involving landscape scale impacts.</p> | | | | | | | | | | | | |
| Professional Vision | <p>Mark is committed to the efficient delivery of sustainable development involving the incorporation of maintain or improve ecological outcomes.</p> | | | | | | | | | | | | |
| Skills | <ul style="list-style-type: none"> • Biodiversity surveys and assessment • Biodiversity offsetting including BioBanking assessments • Design and implementation of monitoring programs • Data analysis and statistics • Project management • Environmental approvals (EIS, REF) • Peer review • Government agency consultation and advocacy • Management planning • Constraints and opportunities analysis | | | | | | | | | | | | |

Key achievements/ flagship projects

Mining projects

Maules Creek Coal Project 2014 - present
Vickery Coal Project 2012-2013
Spur Hill Coal Project 2013 - present
Caroona Coal Project 2013 - present
Wambo South underground project (2012 - present)
Shenhua Watermark Coal Project; Drill Hole Clearances, 2011-2012
Moolarben Coal Mine; Biodiversity Impact Assessment (stage 1 and 2), 2004-2009
Hebburn No. 2 Chitter Reprocessing; Biodiversity Impact Assessment, 2007
Muswellbrook Coal No. 2 Open Cut; Biodiversity Impact Assessment, 2001
Ashton Coal Mine; Biodiversity Impact Assessment, 2001
Anvil Hill; Baseline Investigations and Drill Hole Clearances, 2001-2002

Monitoring projects

Wambo Coal Remnant Woodland Enhancement Program - Monitoring 2013
Hunter8 Third Track Upgrade: Cave Roosting Bat Management and Monitoring Plan, 2012
Muswellbrook Donkey Orchid Management Plan and Monitoring 2004-2008

Linear projects

Thomas Mitchell Drive Upgrade: Ecological Impact Assessment and Referral 2011-12
Pacific Highway Upgrade: Oxley Highway to Kempsey Biodiversity Impact Assessment 2010-2012
Redbank Rail Tunnel Bypass (Tahmoor Colliery) Biodiversity Impact Assessment 2010-2012
Hunter8 Third Track Upgrade: Flora and Fauna Management Plan, 2010
Hunter8 Third Track Upgrade: Fauna monitoring for vegetation clearing, 2011-12
Hunter8 Third Track Upgrade: BioBanking Assessment for two BioBank sites, 2011-12
Nullo Mountain Road: REF and Biodiversity Impact Assessment, 2010
Pacific Highway Upgrade: Iluka - Woodburn Fauna survey 2006

Property Development

Midal Cabling Project - Tomago: Biodiversity Impact assessment SSD, 2011-12
Residential Development - Tea Gardens Notional BioBanking Assessment SSD, 2012
Rural residential development - Singleton: Biodiversity Impact Assessment and offset negotiations, 2006

Offsetting Projects

Black Jack Mountain: BioBanking Assessment for BioBank site, 2014
Mary's Mount: BioBanking Statement Application, 2013
Karuah: BioBanking Assessment for a BioBank site, 2012
Mullaway: BioBanking Statement Application, 2012
Bonville: BioBanking Statement Application, 2012
Valley Arm: BioBanking Assessment for a BioBank site, 2011
Red Rock: Vegetation mapping and plot data collection of a BioBank site, 2011

Qualifications

Bachelor of Science, University of Sydney
 Double Major: Environmental Science and Biology

Employment History

2013 - Ecologist, Niche Environment and Heritage Pty Ltd
 2012 - 2013 - Graduate Ecologist, RPS Pty Ltd
 2011 - 2012 Laboratory Assistant, University of Sydney Institute of Marine Science

Skills

- Ecological surveys
- Environmental impact assessments
- Biobanking survey methodology
- Ecological monitoring and mine rehabilitation surveys including riparian assessments, Landscape Function Analysis, habitat complexity.
- Vegetation survey and mapping
- Report writing and technical review
- Habitat condition assessment

Key achievements/ flagship projects

- Baseline Study and Environmental Impact Assessment of Mt Airly mine extension (Flora and Fauna Assessment) (2012-2013)
- Environmental Impact Assessment of Angus Place mine extension (Flora and Fauna Assessment) (2012-2013)
- Environmental Impact Assessment of Springvale mine extension (Flora and Fauna Assessment) (2012-2013)
- Baseline Study of Neubecks mine (Flora and Fauna Assessment) (2012-2013)
- Environmental Impact Assessment for Clarence mine extension (2012-2013)
- Wambo Coal Remnant Woodland Enhancement Program - Monitoring (2012-current)
- Balranald Mineral Sands Project (2013 - current)
- Environmental Impact Assessment of Mandalong mine extension (Flora and Fauna Assessment) (2012-2013)
- Environmental Impact Assessment of Newstan mine extension (Flora and Fauna Assessment) (2012-2013)

SIMON TWEED B. EnvSc (Hons)
Senior Ecologist/Project Manager



Qualifications

- Bachelor of Environmental Science (Honours)- Wollongong University (2004)
- Honours project completed for Port Kembla Port Corporation (High Distinction): Investigated intertidal communities on breakwaters and natural rocky shores.

Employment History

- 2010 -present Senior Ecologist - Niche Environment and Heritage Pty Ltd
- 2010 (8 months) Project Officer - NSW Dept. of Environment, Climate Change and Water. Conservation Strategy Unit. Temporary contract working to review, re-design and implement a state-wide cost effective approach for threatened species management (Priorities Action Statement 2)
- 2006 - 2010 Ecologist/Aquatic Ecologist, Eco Logical Australia. (Consultant Ecologist)
- 2005 - 2006 Waterways Project Officer - Wimmera Catchment Management Authority (VIC)
- Casual/Graduate Employment**
- 2004 - 2005 Interpretive Guide - NSW National Parks and Wildlife Service, Budderoo
- 2004 Graduate Researcher, Port Kembla Port Corporation
- 2002 - 2004 Assistant Environmental Officer - Illawarra Coal, BHP Billiton (Elouera, Appin and Tower Collieries).

Career Overview

Simon's NRM career spans 12 years working across private, government and NGO sectors. Simon has worked extensively as a consultant in NSW conducting ecological impact assessment, management planning, ecological monitoring and project management of medium to large projects.

Simon's previous role with OEH has equipped him with a thorough knowledge of State and Federal planning frameworks and their application to a wide range of projects for private and public sectors. He has a strong knowledge of threatened species assessment and recovery planning.

Simon's range of roles has equipped him with wide ranging fieldwork and coordination skills. He has completed extensive terrestrial flora and fauna surveys throughout the Sydney Basin and remote areas of New South Wales, water-quality sampling and analysis, invertebrate and macro-algal/plant surveys from marine and wetland communities and seagrass mapping. Simon has developed strong and effective oral and written communication skills as well as technical skills with GIS in mapping and analysis.

Professional Vision

To promote and apply conservation principles in a pragmatic and innovative manner to enhance the interaction between people and biodiversity. I hope to use my knowledge of ecosystem values to facilitate proper assessment and understanding of such values. I will strive to meet the challenges of ecologically sustainable development by thoughtful application of conservation principles including those on which our planning system are founded.

Skills

- Ecological surveys, assessment and monitoring
- Creative design solutions based on conservation outcomes
- BioBanking Assessments
- Project management
- Environmental approvals
- Government agency consultation and advocacy
- Effective communication on environmental matters to a wide-ranging audience
- GIS

Key achievements/ flagship projects

*Review of Environmental Factors (REF) for Provision of Artificial Bird Roosts in Botany Bay (Project Manager)** - Reviewed shorebird ecology and advice from local shorebird experts to design a layout and procedure for introducing roost habitat. The project involved field verification of seagrass mapping, potential roost utilisation and impacts on oyster-lease areas regarding food health. Conducted and facilitated consultation between numerous government authorities to allow for tempering of design and lodging of the REF.

*Preliminary Environmental Assessment for Water Pipeline between Goulburn and Wingecarribee Dam (Project Manager)** - Managed project investigating environmental aspects of the proposed pipeline, including discussion of potential impacts and benefits, and implications regarding climate change and environmental water supply.

*Flora and Fauna Assessment for Major Windfarm Projects** Carried out field survey, project management, design input and reporting for several proposed windfarms within NSW. Projects required assessment, and approval under NSW and Commonwealth planning frameworks.

*Coolangatta Harbour Aquatic Assessment** - Identification and mapping of sensitive marine environments including SEPP 14 wetlands within the Shoalhaven estuary for a preliminary assessment under Part 3A of the EP&A Act. The project included assessment and mapping of seagrass and intertidal communities as well as consideration of impacts from dredging and marina development.

*Shellharbour Hardrock Resource Review**. Conducted flora surveys to assess the extent and condition of endangered ecological vegetation communities and revise mapping boundaries and records of threatened species. Conducted fauna surveys targeting threatened species including owls, frogs, bats and mammals. Simon was responsible for reporting the findings from fieldwork to the Dept. of Planning and outlining recommendations for management. He was also responsible for producing the mapping outputs during the project.

*Sydney Catchment Authority Proposed Water Infrastructure Assessment** Conducted flora and fauna assessments over two weeks in remote catchment areas to assess impacts of proposed infrastructure for water transfer and storage. Assessment included a range of flora and fauna survey methods including Elliot and harp trapping, frog censuses and targeted searches for threatened species.

Tom Thumb Lagoon Saltmarsh Assessment (current project - ELA) Conducted literature review and survey of saltmarsh environments to elucidate the causes of Saltmarsh dieback. Recommendations were delivered to Wollongong Council and contaminated land specialists for further investigation.

Fish Migration Project^ (Project Manager) investigated the ecological consequences of removing barriers to fish migration within the Wimmera River. I was responsible for creating the design of the study and procurement of contractors. I also managed enquiries from residents and the fishing community who had an interests or concerns about the project.

Wimmera Wetlands Monitoring Project^. I reviewed past data on wetland ecology and classification and created a sampling design to monitor water quality and health of wetlands. After project development, I organised the hire of monitoring equipment and laboratory analysis of samples, controlled the budget and gathered data in the field. During sampling I invented novel solutions to overcome problems associated with monitoring wetland shallows, and collated and analysed data.

*Projects conducted for ELA

^Projects conducted for Wimmera CMA

ROSS JENKINS BSc (Hons), MSc, GradDipGIS, PhD
Senior GIS Officer



| | |
|--|---|
| <p>Professional Memberships</p> | <ul style="list-style-type: none"> • American Society for Photogrammetry and Remote Sensing • Geological Society of Australia |
| <p>Qualifications</p> | <ul style="list-style-type: none"> • BSc (Honours) - James Cook University and University of Newcastle • MSc (Geology) - University of Newcastle • Graduate Diploma in GIS - University of Queensland • PhD (Geography) - University of New England |
| <p>Employment History</p> | <p>2011 - present Senior GIS Officer, Niche Environment and Heritage Pty Ltd</p> <p>2010 Director, Beyond Landcover Pty Ltd</p> <p>2010 Senior Technical Officer, University of New England</p> <p>2003-2006 GIS Lecturer, University of the Sunshine Coast</p> <p>1999-2003 GIS Officer, Maroochy Shire Council</p> <p>1999 Supervisor, CADET Inc</p> <p>1996 Tutor, University of the Sunshine Coast</p> <p>1988-1994 Tutor, University of Newcastle</p> <p>1981-1987 Geologist, AOG Minerals Ltd, Freeport McMoRan, Nedex PL, U of Newcastle</p> |
| <p>Career Overview</p> | <p>Ross has over 20 years experience in GIS, remote sensing and geosciences. For the past 10 years he has focussed on GIS and remote sensing through local government (GIS data development and Strategic Planning), tertiary education (GIS and Geography) and PhD research in remote sensing (Environmental Impact Assessment).</p> <p>Ross's professional career began as an exploration geologist in far north Queensland and elsewhere in eastern Australia, where he used remote sensing for back country navigation, geological mapping and geophysical anomaly detection. His geological expertise includes precious metal epithermal and high-level porphyry systems, and Late Palaeozoic crustal evolution of eastern Australia (geochemistry, volcanic and sedimentary facies analysis, structural geology, and Permian coal geology).</p> <p>In 1999 Ross expanded and diversified his skill base, studying GIS and remote sensing while working in southeast Queensland local government, before taking up the challenge of developing spatial science capacity, supervising graduate students and delivering undergraduate courses in geography, GIS, remote sensing and catchment analysis at the University of the Sunshine Coast.</p> <p>Ross undertook Doctoral research using airborne laser scanning and high-resolution satellite imagery at the University of New England, including a six month attachment to the Faculty of Forestry, University of British Columbia. His research focussed on developing baseline methods for native vegetation condition impact assessment.</p> |
| <p>Professional Vision</p> | <p>As a professional GIS analyst, I follow the principles of Qualification Based Services, where it is my responsibility to provide a thorough, complete and best-quality service, according to the scope of the project. I am committed to maintaining a high level of technical and administrative expertise, as well as maintaining ongoing product development, thus ensuring both accountability and value-for-money services.</p> |
| <p>Skills</p> | <ul style="list-style-type: none"> • Advanced remote sensing, GIS and spatial analysis • Vegetation structure and condition survey • Geological mapping • Data development • Tertiary education and training |

Niche Environment and Heritage

A specialist environmental and heritage consultancy.

Head Office

Niche Environment and Heritage
PO Box W36 Parramatta NSW 2150
Email: info@niche-eh.com

All mail correspondence should be through our Head Office

