Appendix 6

Ecological Investigation prepared by Lesryk Environmental Pty Ltd

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Ecological Investigation

Walker Quarry, Wallerawang, NSW

April 2017

Lesnok ENVIRONMENTAL

Cover photographs:

Left: Plot 1 looking west towards the ESEA.
Right: Plot 3 looking west.

Report produced at the request of:

RW Corkery and Co Pty Ltd

on behalf of

Walker Quarries Pty Ltd

by

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This report is prepared with reference to the 6th Edition of the Commonwealth of Australia (2002) Style Manual.

Executive Summary

An environmental assessment of the Wallerawang Quarry operation of Walker Quarries Pty Ltd (Walker Quarries) within Lot 6 DP872230, Lot 7322 DP1149335 and Lot 7071 DP1201227 adjoining the Great Western Highway, Wallerawang, NSW has been undertaken. The survey has been conducted at Wallerawang Quarry as Walker Quarries is seeking approval to modify development consent 344-11-2001 to include extended stockpiling areas.

Clearing for these extended stockpiling areas, known as the Eastern and Western Stockpile Extension Areas, had already been completed at the time of the survey. These areas of clearing having been identified by the Department of Planning and Environment as non-compliant.

As the two Stockpile Extension Areas have been cleared and levelled, surrogate survey sites in adjacent parcels of similar vegetation were sampled. Based on the conducting of investigations within these surrogates, these drawing on the methods detailed in the BioBanking survey manual, it was considered that the vegetation within the Western Stockpile Extension Area would have corresponded to Tableland Gully Mountain Gum - Broad-leaved Peppermint Grassy Forest and Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South-Eastern Highlands Bioregion, whilst Brittle Gum - Broad-leaved Peppermint Grassy Forest and Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion would have dominated the Eastern Stockpile Extension Area.

Neither of these vegetation communities is listed, or currently being considered for listing, under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* or NSW *Threatened Species Conservation Act 1995*. Within, and close to the surrogate plots, no threatened plants were recorded. Similarly, none have been detected within the Quarry Site during previous botanical surveys.

Based on the outcomes of previous ecological studies undertaken within the Quarry Site, combined with a review of known literature and databases, thirteen State and/or Nationally listed threatened animals could have occupied, or utilised on occasion, the vegetation that has been cleared. Assessments undertaken in accordance with under criteria Part 1, Section 5A of the NSW *Environmental Planning and Assessment Act 1979*, and the Significant Impact Guidelines prepared under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* concluded that, of those species known or potentially occurring, the action may have had a significant impact on the Purple Copper Butterfly (*Paralucia spinifera*), or its habitat. Accordingly, a biodiversity offset plan that meets the credit requirements in the BioBanking credit report should be prepared. Contingent upon the implementation of such a plan, the preparation of a Species Impact Statement and referral of the matter to the Federal Minister for Environment and Energy would not be required.

It is considered unlikely that the action had a significant effect or significant adverse impact on any of the other threatened species of state or commonwealth conservation significance known or likely to occur at the subject site.

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Glossary

Abbreviation	Definition
ASL	Above Sea Level
^{0}C	Degrees Celsius
CMA	Catchment Management Authority
DA	Development Application
DE	Commonwealth Department of the Environment (now DEE)
DEC	NSW Department of Environment and Conservation (now known as OEH)
DECC	NSW Department of Environment and Climate Change (now known as OEH)
DEE	Commonwealth Department of the Environment and Energy
DPI	NSW Department of Primary Industries
EIS	Environmental Impact Statement
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
ESEA	Eastern Stockpile Extension Area
FM Act	NSW *Fisheries Management Act 1994*
ha	Hectares
GIS	Geographic Information System
GPS	Global Positioning System[1]
KTP	Key Threatening Process
LGA	Local Government Area
mm/cm/m/km/m^2	Millimetres, centimetres, metres, kilometres, square metres
MNES	Matters of National Environmental Significance
NSW	New South Wales
NPW Act	NSW *National Parks and Wildlife Act 1974*
NPWS	NSW National Parks and Wildlife Service (now known as the NSW Office of Environment and Heritage)
NSWSC	NSW Scientific Committee
NW Act	NSW *Noxious Weeds Act 1993*
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
PMST	Protected Matters Search Tool
RoTAP	Rare or Threatened Australian Plant
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
TSC Act	NSW *Threatened Species Conservation Act 1995*
TSSC	Commonwealth Threatened Species Scientific Committee
VIS	Vegetation Information System
WSEA	Western Stockpile Extension Area

[1] Coordinate system used: GDA94 ± 5 m to 10 m.

For the purpose of this report:

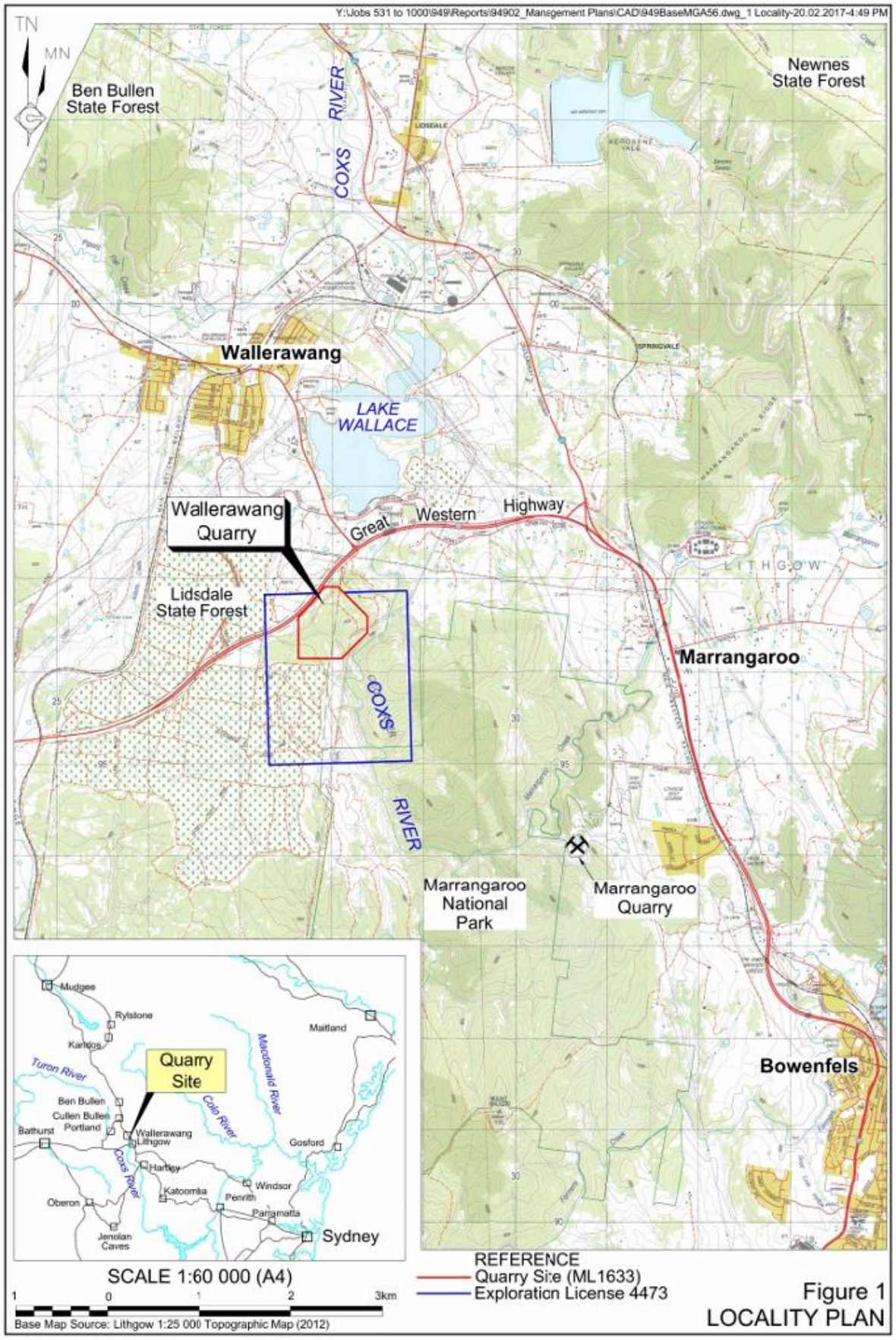
Subject site	is defined as 'the area directly affected by the proposal' [i.e. the ESEA and WSEA] (as per DECC 2007).
Study area	is defined as 'the subject site and any additional areas that are likely to be affected by the proposed works, either directly or indirectly' (DECC 2007).
Study region	is considered to 'include the lands that surround the subject site for a distance of 10 km' (DECC 2007).
Proposal	is considered to include 'all activities likely to be undertaken within the subject site' (DECC 2007).
Local population	of a threatened species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area (DECC 2007).
Important population	is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal • populations that are necessary for maintaining genetic diversity, and/or • populations that are near the limit of the species range (DE 2013).
Fish	means marine, estuarine or freshwater fish or other aquatic animal life at any stage of their life history (whether alive or dead) including oysters and other aquatic molluscs, crustaceans, echinoderms, beachworms and other aquatic polychaetes (as per the definitions provided in the FM Act)

1. Introduction

At the request of Walker Quarries Pty Ltd ("Walker Quarries"), Lesryk Environmental Pty Ltd undertook an ecological investigation of the Wallerawang Quarry Site, Lot 6 DP872230, Lot 7322 DP1149335 and Lot 7071 DP1201227 adjoining the Great Western Highway, Wallerawang, NSW (Figures 1 and 2). The investigation was undertaken as Walker Quarries is seeking approval to modify development consent 344-11-2001 to include extended stockpiling areas.

Clearing for these extended stockpiling areas, known as the Eastern and Western Stockpile Extension Areas, had already been completed at the time of the survey. These areas having been identified by the Department of Planning and Environment as unauthorised for the purpose of clearing and stockpile area development.

The assessment of possible impacts associated with the unauthorised clearing is based on an investigation of the study area, a literature review of previous studies undertaken in both the study region and this portion of the Lithgow LGA, the consultation of standard databases and the consideration of the objectives of the EPBC Act, EP&A Act, NPW Act, TSC Act and any relevant SEPPs.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TN
MN
Ben Bullen State Forest
Newnes State Forest
COXS RIVER
LIDSDALE
KEROSENE VALE
SPRINGVALE
Wallerawang
LAKE WALLACE
Wallerawang Quarry
Great Western Highway
LITHGOW
Lidsdale State Forest
Marrangaroo
COXS RIVER
Marrangaroo National Park
Marrangaroo Quarry
Bowenfels
Mudgee
Rylstone
Kandos
Maitland
Turon River
Quarry Site
Macdonald River
Ben Bullen
Cullen Bullen
Portland
Bathurst
Wallerawang
Lithgow
Colo River
Gosford
Coxs River
Hartley
Windsor
Katoomba
Penrith
Oberon
Parramatta
Jenolan Caves
Sydney
SCALE 1:60 000 (A4)
1 0 1 2 3km
Base Map Source: Lithgow 1:25 000 Topographic Map (2012)
REFERENCE
Quarry Site (ML1633)
Exploration License 4473
Figure 1
LOCALITY PLAN

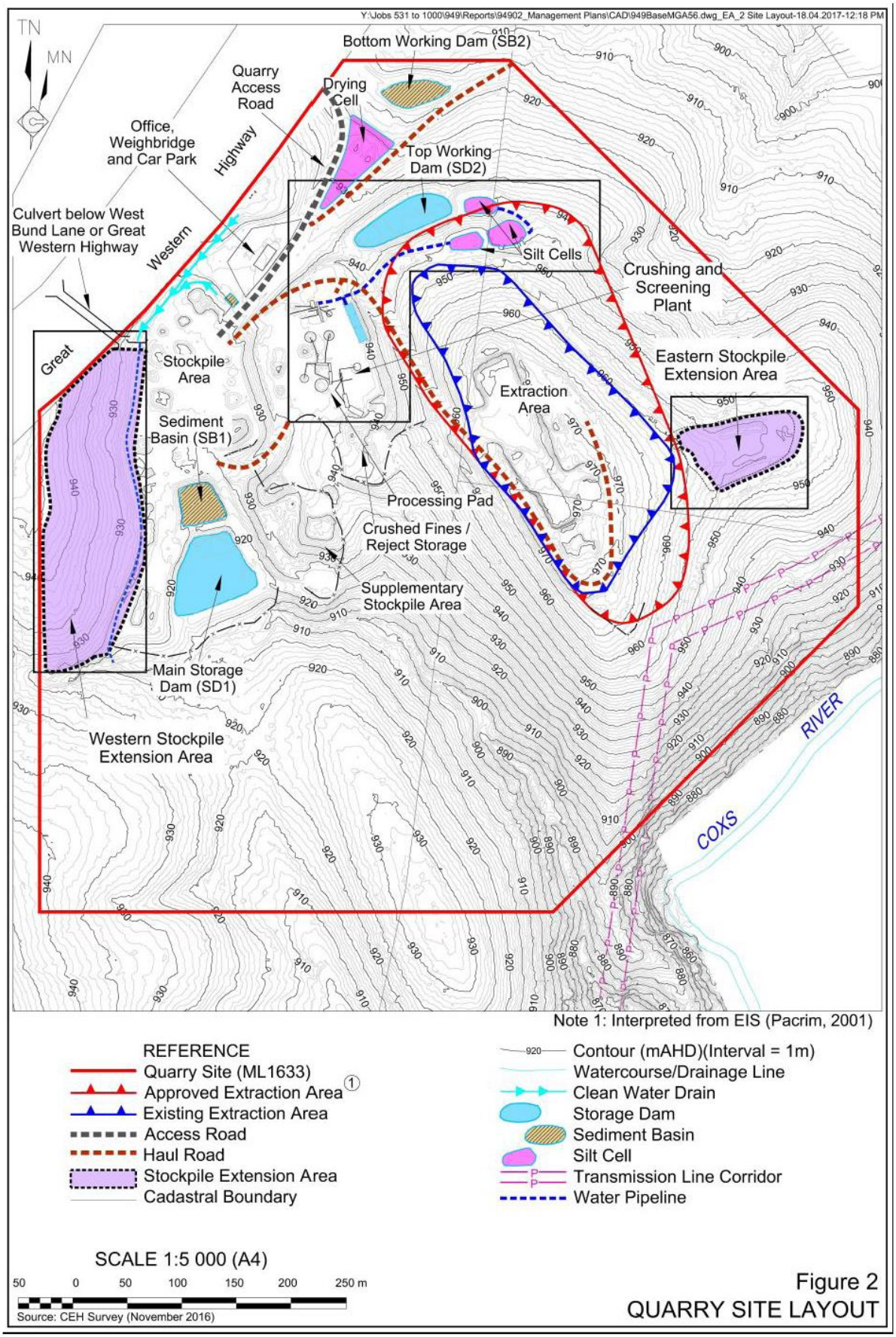


Figure 2
QUARRY SITE LAYOUT

2. Literature review and field guides

Prior to undertaking any fieldwork, previous studies conducted in the region and known databases were consulted to identify the diversity of flora and fauna species known for, or potentially occurring in, the study region. The identification of known or potentially occurring native flora and fauna within this portion of the Lithgow LGA, particularly those listed under the Schedules to the EPBC and/or TSC Acts, thereby permits the tailoring of the field survey strategies to the detection of these plants and animals, their vegetation communities and/or necessary habitat requirements. By identifying likely species, particularly any threatened plants and animals, the most appropriate species-specific survey techniques may be selected should their associated vegetation communities/habitat requirements be present. The undertaking of a literature search also ensures that the results from surveys conducted during different climatic, seasonal and date periods are considered and drawn upon as required. This approach therefore increases the probability of considering the presence of, and possible impacts on, all known and likely native species, particularly any plants and animals that are of regional, state and/or national conservation concern. This approach also avoids issues inherent with a one off 'snap-shot' study.

The studies, reports and databases referred to include:

- the NSW (Mitchell) Landscapes Version 3 (DECC 2008a);
- the Descriptions for NSW (Mitchell) Landscapes (DECC 2008b);
- the OEH BioNet database [Atlas of NSW Wildlife] (OEH 2014a)[2];
- the OEH (2017b) Vegetation Types Database;
- the OEH (2017c) Threatened Species Profile Database;
- Previous assessment reports prepared by Wildthing (1999 and 2002) for the quarry development application;
- Vegetation Monitoring and Purple Copper Butterfly[3] (*Paralucia spinifera*) reports (Lesryk Environmental Pty Ltd 2016a, Lesryk Environmental Pty Ltd 2016b);
- Aerial photographs and satellite imagery of the study area; and
- The DEE Protected Matters Search Tool (PMST) (DEE 2017)

Other reports and documents referred to are provided within the bibliography section of this report.

When accessing the DEE and OEH databases, the search area specified was a 10 km radius around the study area.

These databases and reports were reviewed and drawn upon where relevant. Whilst reviewing these documents, attention was paid to identifying records of species listed under the Schedules of the EPBC and/or TSC Acts, plants, animals and ecological communities that have been recorded in the region and which may occur within, or in the vicinity of, the study area.

[2] The OEH's Atlas of NSW Wildlife which holds data from a number of custodians. Data obtained February 2017.
[3] This species also known as the Bathurst Copper Butterfly.

Field guides and standard texts used include:

- Harden (1992, 1993, 2000 and 2002), Fairley and Moore (2010) and Robinson (2003) (used for the identification of plants);
- Churchill (2008) (bats);
- Cogger (2014) (reptiles and frogs);
- Simpson and Day (2010) (birds);
- Van Dyck and Strahan (2008) (non-flying mammals); and
- Triggs (1996) (identification of scats, tracks and markings).

The naming of those species recorded or known for the region follows the nomenclature presented in these texts, or within the EPBC and TSC Acts.

The conservation significance of those ecological communities, plants and animals recorded is made regarding:

- the RoTAP publication (Briggs and Leigh 1996);
- the EPBC and/or TSC Acts; or
- the vegetation of Western Blue Mountains, including the Capertee, Coxs, Jenolan and Gurnang Areas (DEC 2006).

3. Field survey methods

An investigation of the areas disturbed was carried out by Paul Burcher $_{(B.App.Sc.)}$ and Nicholas Everitt ($_{B.Env.Sc.}$) on 21 February 2017. Weather conditions experienced during this investigation were clear skies, light to moderate winds and moderately warm temperatures (maximum of 25˚C).

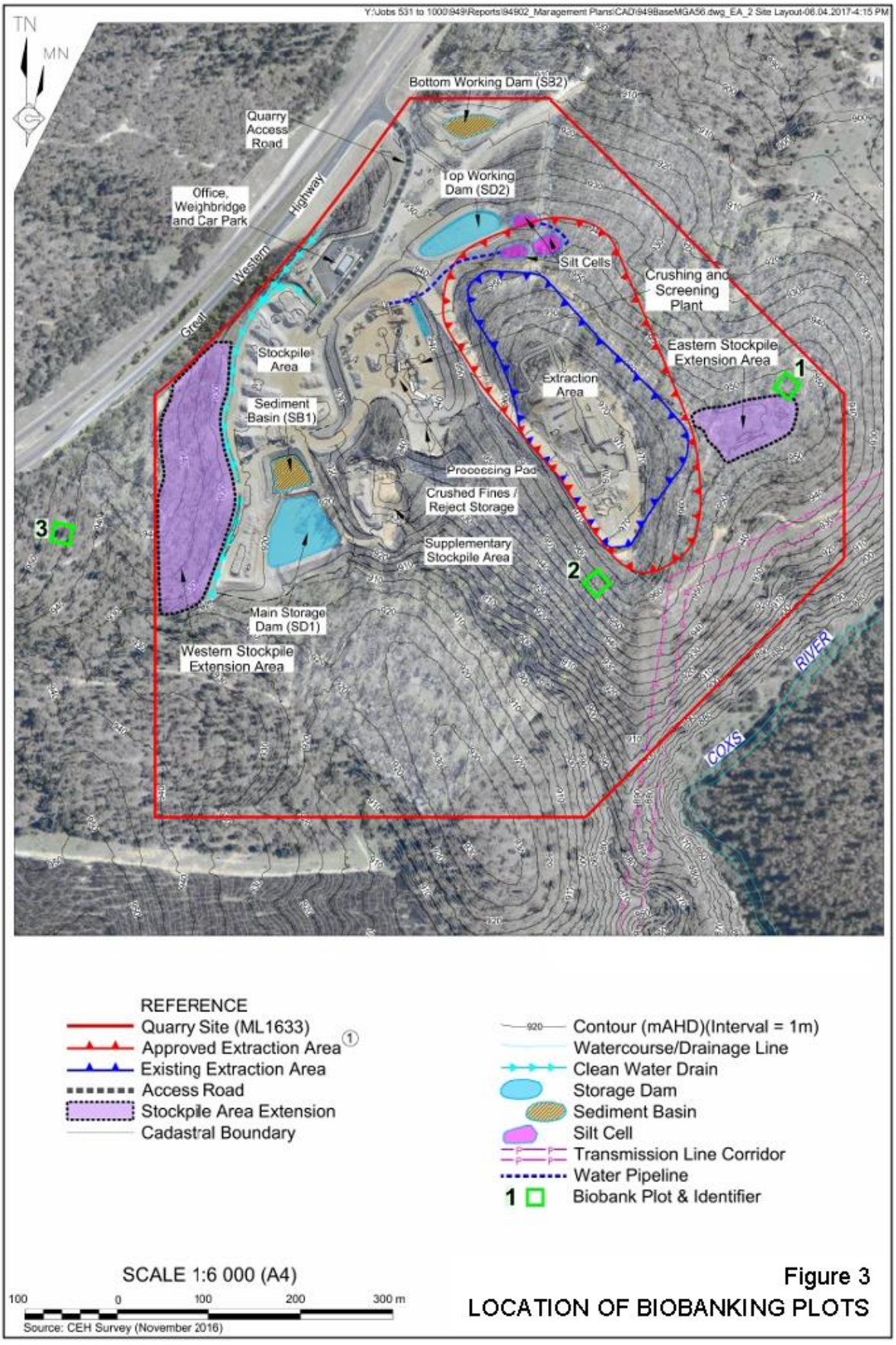
3.1 Flora/Biobanking Survey

The subject site has already been cleared. As such, the survey focused on using surrogates for the cleared vegetation in adjacent remnant bushland within both the quarry property and Lidsdale State Forest. Three 50 m x 20 m BioBanking plots were established and data collected in accordance with the methods detailed in the BioBanking survey manual (DECC 2009).

In each 50 m x 20 m plot (Figure 3) the number of hollow-bearing trees, length of fallen logs and over-storey regeneration present was recorded, along with:

- a 20 m x 20 m plot in which all flora species were recorded along with their growth form and abundance; and
- a 50 m transect along which groundcover was recorded at 1 m intervals and shrub and canopy cover at 5 m intervals.

Data were directly entered into a digital excel spreadsheet configured specifically for this purpose.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TN
MN
Bottom Working Dam (SB2)
Quarry Access Road
Top Working Dam (SD2)
Office, Weighbridge and Car Park
Highway
Western
Great
Silt Cells
Crushing and Screening Plant
Eastern Stockpile Extension Area
Stockpile Area
Extraction Area
Sediment Basin (SB1)
Processing Pad
Crushed Fines / Reject Storage
Supplementary Stockpile Area
Main Storage Dam (SD1)
Western Stockpile Extension Area
RIVER
COXS
1
2
3
REFERENCE
Quarry Site (ML1633)
Approved Extraction Area
Existing Extraction Area
Access Road
Stockpile Area Extension
Cadastral Boundary
Contour (mAHD)(Interval = 1m)
Watercourse/Drainage Line
Clean Water Drain
Storage Dam
Sediment Basin
Silt Cell
Transmission Line Corridor
Water Pipeline
Biobank Plot & Identifier
SCALE 1:6 000 (A4)
100 0 100 200 300 m
Source: CEH Survey (November 2016)
Figure 3
LOCATION OF BIOBANKING PLOTS

3.2 Fauna Survey

Concurrent to the BioBanking survey, a fauna survey was conducted to determine which threatened fauna species occur, or are likely to occur on the site. Methods used during the fauna survey were:

- the direct observation of fauna species in or near the subject site;
- the identification of diurnal calls heard;
- the identification of indirect evidence including scats, scratchings and diggings;
- litter and ground debris searches for reptiles and amphibians; and
- habitat assessment.

Limitations of the Fauna Survey

It is acknowledged that the timing of the survey did not coincide with the activity period of the Purple Copper Butterfly. This shortcoming is addressed through habitat assessment and Biodiversity credits for this species, these credits being generated automatically in the BioBanking calculator based on the type and quality of the vegetation sampled in the BioBanking plots.

In relation to other locally occurring threatened species that may not have been detected during the survey, it is considered that their habitat requirements are sufficiently understood such that an assessment of their likelihood of occurrence can be made.

3.3 Geographical Information System Analysis

GIS was used for the following tasks:

- plotting the subject site, BioBanking plots and vegetation mapping/biodiversity values across the subject site;
- calculating the extent of native vegetation removed within the subject site for entry into the BioBanking credit calculator;
- determining the CMA, CMA Sub-region and Mitchell Landscape of the development site; and
- plotting 200 ha and 2000 ha assessment circles around the site in which landscape scores (native vegetation cover, extent and connectivity) were calculated for entry into the BioBanking credit calculator.

4. Results of the literature review

4.1. Flora

4.1.1. Threatened flora

Filtering of the PMST and Bionet databases (DEE 2017, OEH 2017a) identified 21 threatened plant species that have been previously recorded, or are considered likely to occur based on habitats present, in the study region (Attachment 2). Based on a review of standard texts and vegetation mapping, there is the possibility that the study area may provide potential habitat for some of these species. Therefore, during the field investigation, efforts were made to target these plants, or occurrences of their habitat requirements.

4.1.2. Vegetation mapping

Vegetation mapping of the Western Blue Mountains region conducted by DEC (2006) encompasses the subject site (Figure 4). All the ESEA and most of the WSEA were mapped as Map Unit 35 Tableland Slopes Brittle Gum - Broad-leaved Peppermint Grassy Forest. A small area in the south of the WSEA was mapped as Map Unit 34 Tableland Gully Mountain Gum - Broad-leaved Peppermint Grassy Forest with its north mapped as Cleared and Severely Disturbed Lands.

Table 1 illustrates the relationship between the vegetation communities mapped by DEC (2006), their equivalents at a state scale (OEH 2017c) and whether they are part of an endangered ecological community listed on the EPBC or TSC Acts.

Table 1: Relationship between vegetation mapping classifications

Regional Vegetation Community (DEC 2006)	**VIS Classification (OEH 2017c)**	**Endangered Ecological Community**
Cleared and Severely Disturbed Lands	Cleared land	No
Map Unit 35 Brittle Gum - Broad-leaved Peppermint Grassy Forest	PCT 1093 Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	No
Map Unit 34 Tableland Gully Mountain Gum - Broad-leaved Peppermint Grassy Forest	PCT 732 (HN515) Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion	No[4]

None of these vegetation communities are considered to conform to any ecological community listed, or currently being considered for listing, on the EPBC or TSC Acts.

4.2. Fauna

Filtering of the PMST and Bionet databases (DEE 2017a, OEH 2017a) identified 52 threatened fauna species that have been previously recorded, or are considered likely to occur based on habitats present, in the study region. Based on the review of standard texts, there is the possibility that the study area would provide potential habitat for some of these species. Therefore, during the field investigation, efforts were made to target these species, or occurrences of their documented habitat types.

[4] Some equivalents of this PCT in DEC's Western Blue Mountains mapping (i.e. Map Units 11 and 15) correspond to the TSC Act listed endangered ecological community Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions. However, Map Unit 34 is not mentioned in the final determination as being part of this endangered ecological community.

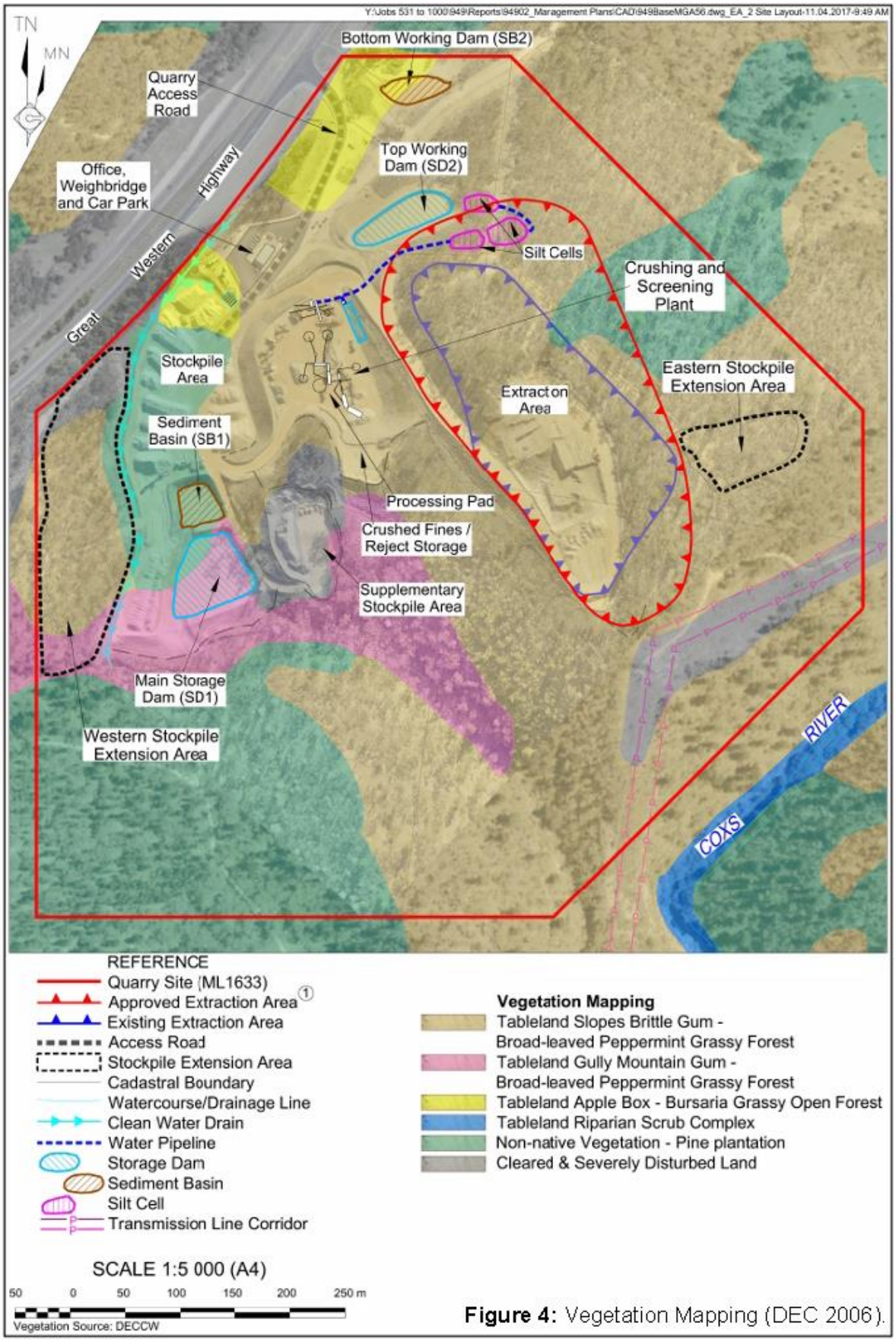

Figure 4: Vegetation Mapping (DEC 2006).

5. Field Survey Results

5.1. Flora

By the completion of the field survey 51 plant species, two of which are introduced, were recorded (Attachment 3). It is acknowledged that Attachment 3 is not intended to be a comprehensive list of all species that may have been present in the WSEA and ESEA, and only represents those plants that were recorded whilst surveying the nearby Biobanking plots.

Of those plants recorded, it is noted that none are listed, or currently being considered for listing, on the Schedules to the EPBC or TSC Acts. Similarly, none are of regional conservation significance or listed as a RoTAP species (Briggs and Leigh 1996). Whilst their presence was considered, and targeted investigations undertaken, none of the plants listed in Attachment 2 were recorded within, or close to, the Biobanking plots.

One of the exotic species recorded, Blackberry (*Rubus fruticosus* agg. spp.), is declared as a noxious weed within the Lithgow LGA (as per the *Noxious Weeds Act 1993*). The control class for this species is 4, which states that, 'the growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed'. This species was recorded in Lidsdale State Forest.

5.2. Fauna

By the completion of the field survey, two native mammal species, 17 native bird species and one reptile species had been recorded, or indicated as occurring within, or near, the subject site (Table 2). This is by no means an exhaustive list of the animals that would utilise, or fly over, the subject site and only represents those species that were recorded during the field investigation.

Table 2: Fauna species recorded within the study area.

Common Name	Scientific Name	Method of Detection
MAMMALS		
Common Wombat	*Vombatus ursinus*	Scats
Eastern Grey Kangaroo	*Macropus giganteus*	Observed
BIRDS		
Yellow-tailed Black-cockatoo	*Calyptorhynchus funereus*	Observed
Australian King Parrot	*Alisterus scapularis*	Observed
Crimson Rosella	*Platycercus elegans*	Observed
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	Heard
Dollarbird	*Eurystomus orientalis*	Observed
White-throated Treecreeper	*Cormobates leucophaea*	Heard
Superb Fairy-wren	*Malurus cyaneus*	Observed
Yellow Thornbill	*Acanthiza nana*	Observed
Spotted Pardalote	*Pardalotus punctatus*	Heard
Striated Pardalote	*Pardalotus striatus*	Heard
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	Observed
Grey Shrike-thrush	*Colluricincla harmonica*	Heard
Scarlet Robin	*Petroica boodang*	Observed
Australian Magpie	*Cracticus tibicen*	Observed
Grey Fantail	*Rhipidura albiscapa*	Observed
Pied Currawong	*Strepera graculina*	Heard
Eastern Yellow Robin	*Eopsaltria australis*	Heard
REPTILES		
Dark-flecked Garden Sun-skink	*Lamprophilus delicata*	Observed

Of the species detected one, the Scarlet Robin, is listed as vulnerable on the TSC Act. This species was detected adjacent to the ESEA. It, and the Varied Sittella, which is also listed as vulnerable on the TSC Act, were also detected near the ESEA in October 2016 (Lesryk Environmental Pty Ltd 2016b).

The timing of the survey did not coincide with the peak activity period of the Purple Copper Butterfly. During the field inspection undertaken for this report, Blackthorn was found in the WSEA surrogate plot. However, it was not found in the ESEA surrogate plot, nor within the vegetation monitoring plots to its north and west during surveys conducted in October 2016 (Lesryk Environmental 2016b). Therefore, only the 1.9 ha of the WSEA is regarded as having been suitable habitat for the species.

A full list of fauna species recorded and considered likely to occur is presented in Attachment 4.

5.3. Vegetation description

WSEA Surrogate

Vegetation within the Lidsdale State Forest plot that acted as a surrogate for the WSEA was composed of a canopy to 15 m high of Brittle Gum (*Eucalyptus mannifera* subsp. *mannifera*), Apple Box (*E. bridgesiana*) and Snow Gum (*E. pauciflora*). The introduced Radiata Pine (*Pinus radiata*) to 25 m was also present and Broad-leaved Peppermint (*E.dives*) and Ribbon Gum (*E.viminalis*) were observed nearby but not in the plot.

Blackthorn (*Bursaria spinosa* subsp. *lasiophylla*) was the only common shrub species present and was patchily distributed. The groundcover was dense and composed of grasses, graminoids and small shrubs. Common species were Red-anther Wallaby Grass (*Rytidosperma pallidum*), Snowgrass (*Poa sieberiana*), Wattle Mat-rush (*Lomandra filiformis* subsp *filiformis*), Blueberry Lily (*Dianella revoluta*, Poverty Raspwort (*Gonocarpus tetragynus*), Parrot-pea (*Dillwynia phylicoides*), Peach Heath (*Lissanthe strigosa*) and Daisy-leaved Goodenia (*Goodenia bellidifolia*). The introduced pasture grass Cocksfoot (*Dactylis glomerata*) was also common.

ESEA Surrogate

Vegetation immediately east of the ESEA that was composed of a canopy to 15 m of Brittle Gum (*Eucalyptus mannifera* subsp. *mannifera*), Broad-leaved Peppermint (*E.dives*), Apple Box (*E. bridgesiana*) and Snow Gum (*E. pauciflora*). The introduced Radiata Pine (*Pinus radiata*) to 25 m was also present.

The shrub layer was largely absent though some species such as Narrow-leaved Geebung (*Persoonia linearis*) were regenerating. The groundcover was dominated by grasses and graminoids. Dominant species were Red-anther Wallaby Grass, Long-leaved Wallaby Grass (*Rytidosperma longifolium*), Wattle Mat-rush and Spiny-headed Mat-rush (*Lomandra longifolia*).

5.4 BioBanking Plots

Data collected from the BioBanking plots is summarised below.

Table 3. BioBanking data

Biobanking Component	Plot 1 (ESEA surrogate)	Plot 2 (additional plot)	Plot 3 (WSEA surrogate)
PCT	1093	1093	732
Native over-storey cover (%)	21.5	24.5	19
Native mid-storey cover (%)	1.5	0	0
Native ground cover grasses (%)	44	48	70
Native ground cover shrubs (%)	4	0	6
Native ground cover other (%)	22	20	22
Exotic plant cover (%)	0	0	14
Native plant species richness	31	19	26
Number of trees with hollows	3	1	1
Over-storey regeneration	1	1	1
Total length of fallen logs (m)	77	72	68

5.5. Conservation significance of the vegetation

Based on the results of the BioBank plots, a review of diagnostic species in the VIS PCT database and consideration of the topographic characteristics of the WSEA, it is considered that the vegetation within the WSEA site would have corresponded to:

- Tableland Gully Mountain Gum - Broad-leaved Peppermint Grassy Forest (DEC 2006); and
- PCT 732 Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South-Eastern Highlands Bioregion (OEH 2017c).

The vegetation that was cleared in the ESEA

- Brittle Gum - Broad-leaved Peppermint Grassy Forest of DEC (2006); and
- PCT 1093 Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion (OEH 2017c).

Neither of the cleared areas would have supported vegetation that conforms to an endangered ecological community or critically endangered ecological community listed on the TSC or EPBC Acts. In particular, they do not conform to any of the four threatened ecological communities OEH mentioned in its submission regarding the biodiversity assessment, namely:

- Blue Mountains Shale Cap Forest in the Sydney Basin Bioregion;
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion;
- Sun Valley Cabbage Gum Forest in the Sydney Basin Bioregion; and
- White Box Yellow Box Blakely's Red Gum Woodland.

6. Ecological assessments

6.1. Commonwealth - *Environment Protection and Biodiversity Conservation Act 1999*

The Purple Copper Butterfly and the Spotted-tailed Quoll (*Dasyurus maculatus*) (south-east mainland population) are MNES listed on the EPBC Act that were considered likely to have occurred within or utilised the subject site. No other threatened species nor any endangered ecological communities listed under this Act were recorded within the study area or have been recorded previously [Wildthing 1999, Wildthing 2002, Lesryk Environmental Pty Ltd 2016b]), nor are any considered likely to occur.

The assessment guidelines that accompany the EPBC Act (DE 2012) were considered to determine the likely impacts of the action (i.e. the clearing of the WSEA and ESEA) on the Purple Copper Butterfly and Spotted-tailed Quoll (Attachment 5). It was concluded that the removal of 1.9 ha of potential habitat may have had a significant impact on the Purple Copper Butterfly. Accordingly, a biodiversity offset plan that meets the credit requirements in the BioBanking credit report (Attachment 6) should be prepared. Contingent upon the implementation of such a plan, referral to the Federal Minister for the Environment to determine whether the Project is a controlled action requiring ministerial approval is not required.

It was found that the action was unlikely to have had a significant impact on the Spotted-tailed Quoll.

6.2. State - *Environmental Planning and Assessment Act 1979*

Part 1, Section 5A of the EP&A Act requires the consideration of the impacts of a proposed action on threatened species, populations and communities listed under the TSC Act. These criteria are designed to determine whether there is likely to be a significant effect on these threatened species and communities, or their habitats, and consequently whether a SIS is required.

Based on the literature and database review and consideration of the likely habitat characteristics of the WSEA and ESEA prior to clearing, it is considered that the following species listed on the TSC Act would have inhabited or utilised on occasion the subject site:

- Purple Copper Butterfly;
- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Powerful Owl (*Ninox strenua*);
- Barking Owl (*Ninox connivens*);
- Brown Treecreeper (*Climacteris picumnus*);
- Varied Sittella (*Daphoenositta chrysoptera*);
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*);
- Scarlet Robin;
- Flame Robin (*Petroica phoenicea*);
- Spotted-tailed Quoll;
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*); and

- Greater Broad-nosed Bat (*Scoteanax rueppellii*).

No endangered ecological communities or endangered populations listed under the Schedules to the TSC Act were considered likely to occur at the subject site. As no areas of suitable aquatic habitat were present, no species listed as critically endangered, endangered or vulnerable on the NSW FM Act were considered likely to occur.

Assessments under Section 5A of the EP&A Act (commonly referred to as the 'seven-part test') were undertaken to determine whether the action (i.e. the clearing of the WSEA and ESEA) was likely to have had a significant effect on these species, or their habitats (Attachment 5).

In relation to the Purple Copper Butterfly, it was concluded that the clearing of 1.9 ha of potential habitat may have had a significant effect on the Purple Copper Butterfly, and its habitat. Accordingly, a biodiversity offset plan that meets the credit requirements in the BioBanking credit report (Attachment 6) should be prepared. Contingent upon the implementation of such a plan, the preparation of a SIS is not required.

Each of the other species have much broader distributions than the Purple Copper Butterfly and most have larger territorial requirements, meaning they are less sensitive to small-scale habitat loss and modification.

The assessments conducted concluded that the clearing of the WSEA and ESEA would not have had a significant effect on an ecological community, threatened species, population, or their habitats. Consequently, the preparation of a SIS that addresses these threatened species is not required.

7. BioBanking Credit Report

Given the clearing of the 2.4 ha of native vegetation has already occurred and that the proponent is applying to formalise the use of the WSEA and ESEA as part of the quarrying operations, it was considered that the Biobanking Credit calculator would be the appropriate tool for determining the level and types of offsets required in terms of the impacts on the Purple Copper Butterfly and those PCTs present. The Purple Copper Butterfly was the only 'species credit species' likely to have occurred at the subject site. The other threatened species likely to occur were all 'ecosystem credit species' whose presence is factored into the credits required for the PCTs. Whilst it was found that the clearing of the WSEA and ESEA is unlikely to have had a significant effect on those species, it is considered that offsetting for the removal of the vegetation should be undertaken.

The full Biobanking report is appended to this report as Attachment 6. A summary of the credit results is present overleaf in Tables 4 and 5.

8. Conclusions

Based on the results of the database and literature review and the field survey of areas adjacent to the WSEA and ESEA, thirteen threatened species listed under the TSC and EPBC Acts were recorded or considered likely to utilised the study area, namely the:

- Purple Copper Butterfly;
- Gang-gang Cockatoo;
- Powerful Owl;
- Barking Owl;
- Brown Treecreeper;

- Varied Sittella;
- Dusky Woodswallow;
- Scarlet Robin;
- Flame Robin;
- Spotted-tailed Quoll;
- Yellow-bellied Sheathtail-bat;
- Eastern False Pipistrelle; and
- Greater Broad-nosed Bat.

Regarding the assessment criteria provided under Part 1, Section 5A of the EP&A Act, and the Significant Impact Guidelines prepared under the EPBC Act, the action may have had a significant impact on the Purple Copper Butterfly, or its habitat. Accordingly, a biodiversity offset plan that meets the credit requirements in the BioBanking credit report (Attachment 5) should be prepared. Contingent upon the implementation of such a plan, the preparation of an SIS and referral of the matter to the Federal Minister for Environment and Energy is not required.

It is considered unlikely that the action had a significant effect or significant adverse impact on any of the other threatened species of State or national conservation significance known or likely to occur at the subject site.

Table 4. Ecosystem credits

Plant community type code	Management zone area (ha)	Loss in Landscape Value	Loss in site value score	EEC Offset Multiplier	Credits req for TS[5]	TS with highest credit requirement	TS offset multiplier	Ecosystem credits required
HN515 (PCT 732)	1.90	17.00	78.26	1.0	120	Barking Owl	3.0	120
HN570 (PCT 1093)	0.50	17.00	85.42	1.0	34	Barking Owl	3.0	34

Table 5. Species credits

Scientific name	Common name	TS offset multiplier	Species credits required
Paralucia spinifera	Purple Copper Butterfly, Bathurst Copper Butterfly	7.7	146

[5] TS – threatened species.

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Attachment 1: Photographic record of project area.

Plate 1: Plot 1 looking south

Plate 2: Plot 3 looking west

Attachment 2: Flora and fauna species of conservation significance previously recorded within the study region and a likelihood of their occurrence.

Key

V - vulnerable E - endangered CE - critically endangered M – migratory

Species underlined are those which only the *EPBC* Protected Matters Search tool predicted as likely to occur or having habitat in the search area or those that OEH has specifically requested be considered. All other species have been recorded within 10 km of the subject site.

* - habitat requirements were generally extracted from Frith (2007), Churchill (2008), Cogger (2014), Harden (1992-2002), Van Dyck and Strahan (2008) and DEE (2017b), OEH (2017c) with other references used being identified in the bibliography.

Species	Status[1] EPBC	TSC	Habitat[2]	Likelihood of Occurrence	Significance assessment undertaken?
PLANTS					
Acacia bynoeana	V	V	Heath or dry sclerophyll forest on sandy soils preferring open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches.	Low. Habitat absent.	No
Asterolasia elegans	E	E	Open forest in sheltered gullies on Narrabeen sandstone near Wisemans Ferry and the Colo River.	Low. Habitat absent.	No
Boronia deanei	V	V	Grows in wet heath, often at the margins of open forest adjoining swamps or along streams. Also found in drier open forest on poorly drained peat soils over granite or sandstone.	Low. Habitat absent.	No
Caesia parviflora var. minor		E	Heath, woodland and forest on sandstone.	Low. Habitat absent.	No
Callistemon megalongensis	CE	CE	Known only from eight sites within a small section of the eastern Megalong Valley in the western Blue Mountains where it occurs in Occurs in shrubby swamp habitat and swampy woodland. Associated species include *Callistemon citrinus, Leptospermum morrisonii, L. juniperinum, L. polygalifolium, L. obovatum, Empodisma minus* and *Grevillea asplenifolia* with occasional *emergent Melaleuca linearifolia* and *Eucalyptus camphora*.	Low. Habitat absent.	No
Cryptostylis hunteriana	V	V	Occurs in a range of communities, including swamp-heath and woodland.	Low. Habitat absent.	No

Species	Status[1] EPBC	TSC	Habitat[2]	Likelihood of Occurrence	Significance assessment undertaken?
Derwentia (Veronica) blakelyi		V	Restricted to eucalypt forest, often in moist areas in the western Blue Mountains, near Clarence, near Mt Horrible, on Nullo Mountain and in the Coricudgy Range	Low. Habitat absent	No
Eucalyptus aggregata	V	V	Alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers often with *Eucalyptus pauciflora, E. viminalis, E. rubida, E. stellulata* and *E. ovata*.	Low. Habitat absent.	No
Eucalyptus cannonii[6]		V	Restricted to an area of about 100km by 60km in the central tablelands of NSW between Bathurst-Lithgow and Mudgee-Bylong. Within this area the species is often locally frequent. It occurs in association with a range of eucalypts including the similar but more common Red Stringybark, with which it often hybridises.	Low. Some suitable habitat but locality beyond species' range.	No
Eucalyptus pulverulenta	V	V	Occurs as an understorey plant in open forest, typically dominated by Brittle Gum (*Eucalyptus mannifera*), Red Stringybark (*E. macrorhyncha*), Broad-leafed Peppermint (*E. dives*), Silvertop Ash (*E. sieberi*) and Apple Box *(E. bridgesiana*). Occurs locally between Hartley and Rydal (OEH 2013b).	Medium. Potential habitat present.	No
Eucalyptus robertsonii subsp. hemisphaerica	V	V	Known only from the central tablelands of NSW, at small disjunct localities from north of Orange to Burraga, where it is locally frequent in grassy or dry sclerophyll woodland or forest, on lighter soils and often on granite. Usually found in closed grassy woodlands in locally sheltered sites. Habitats include quartzite ridges, upper slopes and a slight rise of shallow clay over volcanics.	Low. Habitat absent	No
Euphrasia arguta	CE	CE	Rediscovered after 100 years near Nundle in 2008 but historically recorded in grassy country near Bathurst.	Low. Habitat absent.	No
Leucochrysum albicans var. tricolor		E	Woodland and open forest communities at relatively high elevations in woodland and open forest communities, in an area roughly bounded by Goulburn, Albury and Bega.	Low. Habitat absent	No
Lepidium hyssopifolium	E	E	Inhabits grassy woodland and grassland. Extant small populations near Bathurst, Bungendore, and Crookwell.	Low. Habitat absent.	No
Leucopogon fletcheri subsp. fletcheri		E	Dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs. Local record is a dubious, outlying record	Low. Habitat absent.	No

Species	Status[1] EPBC	TSC	Habitat[2]	Likelihood of Occurrence	Significance assessment undertaken?
Pelargonium sp. Striatellum (G.W.Carr 10345)	E		Just above the high water level of irregularly inundated or ephemeral lakes (TSSC 2011).	Low. Habitat absent.	No
Persoonia hindii		E	Restricted to the Newnes Plateau where it occurs in dry sclerophyll forests and woodlands on sandy soils.	Low. Some suitable habitat but locality beyond species' range.	No
Prasophyllum fuscum	CE	V	The type specimen is from "moist meadows towards the Georges River" in the Sydney area, where it is now likely to be extinct from this area. Harden (1993) states that it is confined to the Blue Mountains area. Recorded from moist heath, often along seepage lines.	Low. Habitat absent.	No
Prasophyllum petilum	E	E	Occurs at a small number of sites in the southern tablelands and at Muswellbrook. Grows in Natural Temperate Grassland and grassy woodland.	Low. Habitat absent	No
Prasophyllum sp Wybong	CE	V	Known from known from seven populations in eastern NSW near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell and Tenterfield. Occurs in open eucalypt woodland and grassland.	Low. Habitat absent.	No
Prostanthera cryptandroides subsp. cryptandroides	V	V	Occurs between Lithgow and Sandy Hollow. Local records are from Newnes Plateau in upland swamp. Elsewhere it occurs in a range of dry sclerophyll forest communities.	Low. Habitat absent.	No
Pultenaea glabra	V	V	Swamp margins, hill slopes, gullies and creek banks and occurs within dry sclerophyll forest and tall damp heath on sandstone in the upper Blue Mountains.	Low. Some suitable habitat but locality beyond species' range.	No
Thesium australe	V	V	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*).	Low. Habitat absent.	No
FAUNA					
REPTILES					
Eulamprus leuraensis Blue Mountains Water Skink	E	E	Restricted to sedge and shrub swamps in the middle and upper Blue Mountains from Hazelbrook in the south-east to the Newnes Plateau in the north-west.	Low. Habitat absent.	No

Species	Status[1] EPBC	TSC	Habitat[2]	Likelihood of Occurrence	Significance assessment undertaken?
Hoplocephalus bungaroides Broad-headed Snake	V	E	This species is restricted to the sandstone ranges in the Sydney Basin and within a radius of approximately 200 km of Sydney where it occurs in rocky outcrops and adjacent sclerophyll forest and woodland.	Low. Site beyond distribution and habitat absent.	No
FROGS					
Heleioporus australiacus Giant Burrowing Frog	V	V	Restricted to areas of Hawkesbury Sandstone, this frog prefers sandstone ridge top habitat and broader upland valleys that run through heathland and woodland. Small semi-permanent to slightly flowing streams.	Low. Habitat absent.	No
Litoria booroolongensis Booroolong Frog	V	V	Restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range. It lives along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses.	Low. Habitat absent.	No
Litoria littlejohnii Heath Frog	V	V	Breeds in the upper reaches of permanent streams and in perched swamps. Non-breeding habitat is heath based forests and woodlands where it shelters under leaf litter and low vegetation	Low. Habitat absent.	No
BIRDS					
Oxyura australis Blue-billed Duck		V	Large permanent wetlands and swamps with dense aquatic vegetation	Low. Habitat absent.	No
Numenius madagascariensis Eastern Curlew	M, CE		Non-breeding summer migrant to coast Australia inhabiting with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass.	Low. Habitat absent.	No
Calidris ferruginea Curlew Sandpiper	CE		Non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	Low. Habitat absent.	No
Ardea ibis Cattle Egret	M		Paddocks, pastures, croplands, wetlands, tidal mudflats	Low. Habitat absent.	No
Ardea alba Great Egret	M		Shallows of rivers, estuaries, tidal mudflats, dams, freshwater wetlands	Low. Habitat absent.	No
Gallinago hardwickii Latham's Snipe	M		Boggy pastures, edges of wetlands, sewage and other ponds	Low. Habitat absent.	No
Rostratula australis Australian Painted Snipe	E	V	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds	Low. Habitat absent.	No

Species	Status[1] EPBC	TSC	Habitat[2]	Likelihood of Occurrence	Significance assessment undertaken?
Apus pacificus Fork-tailed Swift	M,		Breeds Siberia, Himalayas & Japan, migrates to Australia during Oct-April where it feeds on insects over a variety of habitats	Moderate. May forage over study area	No
Hirundapus caudacutus White-throated Needletail	M,		Breeds Siberia, Himalayas & Japan, migrates to Australia during Oct-April where it feeds on insects over a variety of habitats	Moderate. May forage over study area	No
Pandion cristatus Osprey	M	V	Coastal areas, especially the mouths of large rivers, lagoons and lakes	Low. Habitat absent.	No
Haliaeetus leucogaster White-bellied Sea-Eagle	M,		Coasts, estuaries, large inland rivers, lakes	Low. Habitat absent.	No
Hieraaetus morphnoides Little Eagle		PV	Plains, foothills, open forests, woodlands and scrublands. For nest sites, it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring.	Moderate. Some foraging habitat present.	No
Lathamus discolor Swift Parrot	E,	E	The Swift Parrot breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south-west slopes. Migrates to the Australian south-east mainland between March and October. On the mainland, they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *E. robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon* and White Box *E. albens*.	No. Favoured feed trees not present	No
Callocephalon fimbriatum Gang-gang Cockatoo		V	In summer, this species is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. It moves to lower altitudes in winter, preferring more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas.	Yes; likely to occur throughout study area woodlands	Yes

Species	Status[1] EPBC	TSC	Habitat[2]	Likelihood of Occurrence	Significance assessment undertaken?
			Favours old growth attributes for nesting and roosting		
Calyptorhynchus lathami Glossy Black-Cockatoo		V	Eucalypt woodland and feeds almost exclusively on casuarina fruit.	Low. No she-oaks in study area.	No
Glosopsitta pusilla Little Lorikeet		V	Eucalyptus forest and woodland, particularly along water courses.	Low. Few local records. Site represents a small proportion of likely habitat area.	No
Ninox strenua Powerful Owl		V	Habitat for this species is widespread and primarily tall, moist productive eucalypt forests of the eastern tableland edge and the mosaic of wet and dry sclerophyll forests occurring on undulating gentle terrain nearer the coast. Nests in old hollow eucalypts in unlogged, unburnt gullies and lower slopes within 100m of streams or minor drainage lines, with hollows greater than 45 cm wide and greater than 100 cm deep. Home range has been estimated as 300-1 500ha according to habitat productivity.	High; likely to forage in study area.	Yes
Ninox connivens Barking Owl		V	Inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Denser vegetation is used occasionally for roosting. During the day, they roost along creek lines, usually in tall understorey trees with dense foliage such as *Acacia* and *Casuarina* species, or the dense clumps of canopy leaves in large Eucalypts. It requires tree hollows for nesting. Home range has been estimated as 225-6,000ha	Moderate. May occasionally forage in study area.	Yes
Merops ornatus Rainbow Bee-eater	M,		Variety of wooded and non-wooded habitats preferring sandy ground and bank cuttings for nesting. Summer breeding migrant from PNG & east Indonesia.	Moderate. May occasionally forage in study area.	No
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)		V	Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open	High; likely to inhabit woodlands and their margins	Yes

Species	Status[1] EPBC	TSC	Habitat[2]	Likelihood of Occurrence	Significance assessment undertaken?
			grassy understorey, sometimes with one or more shrub species; fallen timber is an important habitat component for foraging. Hollows in standing dead or live trees and tree stumps are essential for nesting.	in the study area.	
Pyrrholaemus sagittata Speckled Warbler		V	Inhabits a wide range of eucalypt-dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Large, relatively undisturbed remnants are required for the species to persist in an area.	Moderate. Suitable habitat present but no nearby records.	No
Grantiella picta Painted Honeyeater	V	V	The Painted Honeyeater inhabits eucalypt woodlands and scrub, usually heavily infested with mistletoe. In Western NSW known habitat is usually along floodplains and drainage lines. Nests are usually in the leafy extremities of native trees and this species diet is predominantly mistletoe (*Amyema* spp) berries, though nectar and insects may also be taken.	No. Key feed species absent	No
Xanthomyza phrygia Regent Honeyeater	E, M	E	This species mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. One of the strongholds of the species is the nearby Capertee Valley, though there are also records from Kandos (1998 & 2001) and Clandulla State Forest (1993).	No. No local records; key feed trees absent.	No
Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subspecies)		V	Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions	No. Habitat absent	No
Daphaenositta chrysoptera Varied Sittella		V	Eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Moderate	No
Artamus cyanopterus cyanopterus Dusky Woodswallow		V	Usually found in woodlands and dry open sclerophyll forests characterised by an open understorey and a ground cover of grasses, and/or sedges or open ground, with coarse woody debris. Also, often observed in farm land, usually at the edges of forest or woodland or in roadside remnants or wind breaks with dead timber.	High. Suitable habitat present and nearby records.	Yes

Species	Status[1] EPBC	TSC	Habitat[2]	Likelihood of Occurrence	Significance assessment undertaken?
Melanodryas cucullata cucullata Hooded Robin (south-eastern form)		V	Lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	No. Suitable habitat present but no nearby records.	No
Petroica boodang Scarlet Robin		V	Drier eucalypt forests and temperate woodlands, often on ridges and slopes, within an open understorey of shrubs and grasses and sometimes in open areas. Abundant logs and coarse woody debris are important structural components of its habitat. In autumn and winter, it migrates to more open habitats such as grassy open woodland or paddocks with scattered trees.	Yes. Detected on site.	Yes
Petroica phoenicea Flame Robin		V	Breeds in upland tall moist eucalypt forests and woodlands descending to dry forests, open woodlands and in pastures and native grasslands in winter.	High. Suitable habitat present **and** nearby records	Yes
Motacilla flava Yellow Wagtail	M		Rare visitor to South-eastern Australia. Inhabits saltmarsh	Low. Habitat absent.	No
Monarcha melanopsis Black-faced Monarch	M		Rainforest and wet eucalypt forest.	Low. Habitat absent.	No
Myiagra cyanoleuca Satin Flycatcher	M		Heavily vegetated gullies in forest, tall woodlands; variety of habitats during migration to North-eastern Queensland and Papua New Guinea during February/April.	Low. Habitat absent.	No
Rhipidura rufifrons Rufous Fantail	M,		Understorey of densely vegetated habitat such as open forest and rainforest. Wider range of habitats during migration to Papua New Guinea during March/April	Low. Habitat absent.	No
MAMMALS					
Dasyurus maculatus Spotted-tailed Quoll (SE Mainland Population)	E	V	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. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Nearest record is from the ridge immediately north of the study area, though this is only accurate to	Yes. Likely to use subject site as part of large foraging territory.	Yes

Species	Status[1] EPBC	Status[1] TSC	Habitat[2]	Likelihood of Occurrence	Significance assessment undertaken?
			10 km.		
Phascolarctos cinereus Koala	V	V	Open eucalypt forest and woodland, containing a variety of "preferred" food tree species.	Low. Koala feed tree present (Ribbon Gum) but few recent nearby records.	No
Cercartetus nanus Eastern Pygmy-possum		V	Heathland, woodland and rainforest that support a large number of proteaceous and myrtaceous plants.	Low. Habitat not present.	No
Petauroides volans Greater Glider	V		Typically found in highest abundance in taller, montane, moist, species-diverse eucalypt forests with relatively old trees and abundant hollows.	Low. Not detected during surveys of quarry nor in this part of Coxs River catchment	No.
Pteropus poliocephalus Grey-headed Flying-fox	V	V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. No local records.	No. roosting camps near the study area.	No
Scoteanax rueppellii Greater Broad-nosed Bat		V	Preferring habitats which range from rainforests through to woodlands, this species usually roosts in tree hollows, though some individuals have been found in the roof spaces of old buildings.	High. Likely to forage in study area	Yes
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat		V	Forages over a range of habitats including cleared areas. Requires tree hollows for roosting.	High. Previously detected in study area.	Yes
Chalinolobus dwyeri Large-eared Pied bat	V	V	Found mainly in well-timbered areas containing gullies with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. Roosts in caves, crevices in cliffs, old mine workings and in the disused, bottle-	Moderate. Likely to forage in the study area. No	No

Species	Status[1] EPBC	TSC	Habitat[2]	Likelihood of Occurrence	Significance assessment undertaken?
			shaped mud nests of the Fairy Martin (*Hirundo ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features.	roosting habitat present	
Falsistrellus tasmaniensis Eastern False Pipistrelle		V	Prefers moist habitats, with trees taller than 20 m where it forages on beetles, moths, weevils and other flying insects above or just below the tree canopy. It generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	High. Likely to forage in study area	Yes
Miniopterus schreibersii oceanensis Eastern Bentwing-bat		V	Forages in forested areas, catching moths and other flying insects above the treetops. Caves are the primary roosting habitat, but the species also uses derelict mines, storm-water tunnels, buildings and other man-made structures	Moderate. Likely to forage in the study area. No roosting habitat present	No
Pseudomys novaehollandiae New Holland Mouse	V		Open heathland, open woodland with a heathland understorey and vegetated sand dunes.	Low. Habitat not present.	No
FISH					No
Macquaria australasica Macquarie Perch	E	E	streams and lake habitats especially the upper reaches of rivers and their tributaries. It prefers clear water and deep rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks.	Low. Habitat not present.	No
Maccullochella peelii Murray Cod	V	V	Murray-Darling basin in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs.	Low. Habitat not present.	No
Prototroctes maraena Australian Grayling	V	V	Spends part of its lifecycle in freshwater and at least part of the larval and/or juvenile stages in coastal seas. inhabit cool, clear, freshwater streams with gravel substrate and areas alternating between pools and riffle zones. Also in clear, gravel-bottomed and in muddy-bottomed, heavily silted habitats. The species has been found over 100 km upstream from the sea	Low. Habitat not present.	No
INVERTEBRATES					
Petalura gigantea Giant Dragonfly		E	permanent swamps and bogs with some free water and open vegetation.	Low. Habitat not present.	No

Species	Status[1] EPBC	Status[1] TSC	Habitat[2]	Likelihood of Occurrence	Significance assessment undertaken?
Paralucia spinifera Purple Copper Butterfly	V	V	Occurs above 850 m elevation, at sites with a south-west to north-west aspect, usually where direct sunlight reaches the habitat, and with extremes of cold such as regular winter snowfalls or heavy frosts. Vegetation structure is commonly open woodland or open forest with a sparse understorey that is dominated by the shrub, Blackthorn *Bursaria spinosa subsp. lasiophylla*.	Yes. Detected in study area during assessment for original DA.	Yes

Attachment 3: Flora species recorded within BioBanking Plots

Key

* - indicates introduced species

N - indicates species listed under the *Noxious Weeds Act 1993*.

Species	Common Name
Acacia buxifolia	Box-leaf Wattle
Acacia dealbata subsp. dealbata	Silver Wattle
Acacia longifolia subsp. longifolia	Sydney Golden Wattle
Aristida vagans	Three-awned Speargrass
Arrhenechthites mixtus	Purple Fireweed
Bossiaea buxifolia	
Brachyloma daphnoides	Daphne Heath
Bursaria spinosa subsp. lasiophylla	Blackthorn
Cassytha glabella	Devil's Twine
Cheilanthes sieberi	Poison Rock Fern
Coronidium scorpioides	Button Everlasting
Cyathochaeta diandra	Twisted Sedge
*Dactylis glomerata**	Cocksfoot
Dianella revoluta	Blueberry Lily
Dichelachne micrantha	Shorthair Plumegrass
Dillwynia phylicoides	Parrot-pea
Eucalyptus bridgesiana	Apple Box
Eucalyptus dives	Broad-leaved Peppermint
Eucalyptus mannifera subsp. mannifera	Western Brittle Gum
Eucalyptus pauciflora	Snow Gum
Euchiton involucratus	Star Cudweed
Exocarpos cupressiformis	Native Cherry
Gompholobium huegelii	Pale Wedge Pea
Gompholobium uncinatum	Red Wedge Pea
Gonocarpus tetragynus	Poverty Raspwort
Goodenia bellidifolia subsp. bellidifolia	
Hakea dactyloides	Broad-leaved Hakea
Hardenbergia violacea	False Sarsaparilla
Hibbertia obtusifolia	Hoary Guinea Flower

Species	**Common Name**
Hovea linearis	
Hypericum gramineum	Small St. John's Wort
Hypochaeris radicata	Cats Ear or Flatweed
Joycea pallida	Red-anther Wallaby Grass
Juncus australis	
Lepidosperma laterale	Variable Sword Sedge
Leucopogon appressus	
Lissanthe strigosa	Peach Health
Lomandra filiformis	Wattle Mat-rush
Lomandra longifolia	Spiny-headed Mat-rush
Lomandra multiflora subsp. multiflora	Many-flowered Mat-rush
Mirbelia platylobioides	
Opercularia diphylla	Stinkweed
Patersonia sericea	Silky Purple-flat
Persoonia linearis	Narrow-leaved Geebung
Pinus radiata	Radiata Pine
Poa sieberiana	Snowgrass
Poranthera ericifolia	
Rytidosperma longifolium	Long-leaved Wallaby Grass
*Rubus ulmifolius**[N]	Blackberry
Stackhousia nuda	
Wahlenbergia stricta	Australian Bluebell
Xerochrysum viscosum	Sticky Everlasting

Attachment 4 Likely fauna species assemblage

Key

- species detected during surveys conducted by Wildthing (1998), Lesryk Environmental Pty Ltd (2016) or current investigation.

Bold - threatened species.

***** - introduced species.

Scientific Name	Common Name
Frogs	
Crinia signifera	Common Eastern Froglet
Limnodynastes peroni	Brown-striped Frog
Limnodynastes tasmaniensis	Spotted Grass Frog
Pseudophryne bibroni	Bibron's Toadlet
Litoria fallax	Eastern Dwarf Tree Frog
Litoria peroni	Peron's Tree Frog
Reptiles	
#Amphibolurus muricatus	Jacky Lizard
Amphibolurus nobbi	Nobbi
Acritoscincus platynota	Red-throated Skink
#Ctenotus taeniolatus	Copper-tailed Skink
Hemiergis decresiensis	Three-toed Earless Skink
Lampropholis delicata	Dark-flecked Garden Sunskink
#Lampropholis guichenoti	Pale-flecked Garden Sunskink
Lygisaurus foliorum	Tree-base Litter-skink
Saproscincus mustelinus	Weasel Skink
Tiliqua nigrolutea	Blotched Blue-tongue
Tiliqua scincoides	Eastern Blue-tongue
Austrelaps ramsayi	Highland Copperhead
Pseudechis porphyriacus	Red-bellied Black Snake
Pseudonaja textilis	Eastern Brown Snake
Birds	
Chenonetta jubata	Australian Wood Duck
#Accipiter novaehollandiae	Grey Goshawk
Falco peregrinus	Peregrine Falcon
#Cacatua galerita	Sulphur-crested Cockatoo
Callocephalon fimbriatum	Gang-gang Cockatoo
#Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo
#Alisterus scapularis	Australian King-parrot
Platycercus adscitus eximius	Eastern Rosella
#Platycercus elegans	Crimson Rosella
Trichoglossus haematodus	Rainbow Lorikeet
#Glossopsitta concinna	Musk Lorikeet
#Cacomantis flabelliformis	Fan-tailed Cuckoo
#Cacomantis pallidus	Pallid Cuckoo
Ninox connivens	Barking Owl
Ninox strenua	Powerful Owl
#Podargus strigoides	Tawny Frogmouth
Hirundapus caudacutus	White-throated Needletail

Scientific Name	Common Name
#Dacelo novaeguineae	Laughing Kookaburra
#Todiramphus sanctus	Sacred Kingfisher
#Menura novaehollandiae	Superb Lyrebird
#Cormobates leucophaea	White-throated Treecreeper
***#** Climacteris erythrops*	Red-browed Treecreeper
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)
#Malurus cyaneus	Superb Fairy-wren
#Pardalotus punctatus	Spotted Pardalote
#Pardalotus striatus	Striated Pardalote
#Acanthiza lineata	Striated Thornbill
#Acanthiza pusilla	Brown Thornbill
#Acanthiza regulus	Buff-rumped Thornbill
Gerygone olivacea	White-throated Gerygone
#Sericornis frontalis	White-browed Scrubwren
#Acanthorhynchus tenuirostris	Eastern Spinebill
#Anthochaera carunculata	Red Wattlebird
#Philemon corniculatus	Noisy Friarbird
#Lichenostomus chrysops	Yellow-faced Honeyeater
#Lichenostomus leucotis	White-eared Honeyeater
Meliphaga lewinii	Lewin's Honeyeater
#Phylidonyris novaehollandiae	New Holland Honeyeater
#Eopsaltria australis	Eastern Yellow Robin
Petroica boodang	Flame Robin
Petroica phoenicea	Scarlet Robin
#Petroica rosea	Rose Robin
Psophodes olivaceus	Eastern Whipbird
#Cinclosoma punctataum	Spotted Quail-thrush
#Daphaenositta chrysoptera	Varied Sittella
#Colluricincla harmonica	Grey Shrike-thrush
#Pachycephala rufiventris	Golden Whistler
#Pachycephala pectoralis	Rufous Whistler
Grallina cyanoleuca	Magpie-lark
#Myiagra inquieta	Restless Flycatcher
Myiagra rubecula	Leaden Flycatcher
#Rhipidura albiscapa	Grey Fantail
#Rhipidura leucophrys	Willie Wagtail
#Coracina novaehollandiae	Black-faced Cuckoo-shrike
Coracina tenuirostris	Cicadabird
Artamus cyanopterus cyanopterus	Dusky Woodswallow
# Zosterops lateralis	Silvereye
Cracticus torquatus	Grey Butcherbird
#Gymnorhina tibicen	Australian Magpie
#Strepera graculina	Pied Currawong
#Corvus coronoides	Australian Raven
#Corcorax melanorhamphos	White-winged Chough
Neochmia temporalis	Red-browed Finch
Hirundo neoxena	Welcome Swallow
Mammals	
Tachyglossus aculeatus	Short-beaked Echidna
Antechinus stuartii	Brown Antechinus

Scientific Name	Common Name
Dasyurus maculatus	**Spotted-tailed Quoll**
#Vombatus ursinus	Common Wombat
Petaurus breviceps	Sugar Glider
#Pseudocheirus peregrinus	Common Ringtail Possum
Trichosurus vulpecula	Common Brushtail Possum
#Macropus giganteus	Eastern Grey Kangaroo
#Macropus robustus	Common Wallaroo
Macropus rufogriseus	Red-necked Wallaby
#Wallabia bicolor	Swamp Wallaby
Tadarida australis	White-striped Freetail-bat
Chalinolobus gouldii	Gould's Wattled Bat
Chalinolobus morio	Chocolate Wattled Bat
Falsistrellus tasmaniensis	Eastern False Pipistrelle
Nyctophilus geoffroyi	Lesser Long-eared Bat
Nyctophilus gouldi	Gould's Long-eared Bat
Rhinolophus megaphyllus	Eastern Horseshoe-bat
Saccolaimus flaviventris	**Yellow-bellied Sheathtail Bat**
Scoteanax rueppellii	**Greater Broad-nosed Bat**
Scotorepens orion	Eastern Broad-nosed Bat
#Vespadelus darlingtoni	Large Forest Bat
Vespadelus regulus	Southern Forest Bat
Vespadelus vulturnus	Little Forest Bat
Rattus fuscipes	Bush Rat
*#Felis catus**	Cat
*Canis lupus familiaris**	Dog
*Vulpes vulpes**	European Red Fox
#Oryctolagus cuniculus	Rabbit
Insect	
Paralucia spinifera	**Bathurst Copper Butterfly**

Attachment 5 Ecological Assessments

5.1 Commonwealth - *Environment Protection and Biodiversity Conservation Act 1999*

The Purple Copper Butterfly and the south-east mainland population of the Spotted-tailed Quoll are listed as vulnerable and endangered respectively on the EPBC Act and are thus matters of national environmental significance. The following assessment guidelines prepared under the Act (DE 2013) are used to determine whether the action has, will have, or is likely to have a significant impact on these MNES.

5.1. (a) Purple Copper Butterfly

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- *lead to a long-term decrease in the size of an important population[7] of a species;*

It is assumed the subject population (i.e. that occurring in the vicinity of the quarry) of the Purple Copper Butterfly is an important population.

The Purple Copper Butterfly occurs above 850 m elevation, at sites with a south-west to north-west aspect, usually where direct sunlight reaches the habitat, and with extremes of cold such as regular winter snowfalls or heavy frosts. Geology, soils and dominant vegetation canopy species vary between habitat locations. However, vegetation structure is consistent, commonly open woodland or open forest with a sparse understorey that is dominated by the shrub, Blackthorn *Bursaria spinosa subsp. lasiophylla*, which is used as the larval food plant. Its lifecycle also relies on a mutualistic relationship with the ant, *Anonychomyra itinerans*. Butterflies of the species emerge between August (later at higher altitude sites) and November, with a two-week peak of activity in September. After mating, the females lay eggs on or in the immediate vicinity of Blackthorn shrubs. After hatching, the larvae are attended by the ant *A.itinerans*, which shepherd them to and from Blackthorn plants, providing protection from predators and benefitting by receiving nutritional secretions from the larvae. New blackthorn growth is essential for the larvae and is promoted by post-disturbance conditions such as fire or tree falls which reduce overstorey shading. Without such disturbance, the blackthorn often becomes unsuitable habitat, and the Purple Copper Butterfly can become locally extinct. After fires, the purple copper butterfly can boom in numbers, and spread throughout connected habitat, and possibly reoccupy or invade new areas of fresh blackthorn growth (DECCW 2010b, TSSC 2016).

[7] An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:
- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

It is not known whether the Purple Copper Butterfly occurred within the WSEA or ESEA. It was not detected during a targeted survey for the species in adjacent areas of the quarry during October 2016 (Lesryk Environmental 2016a) but this may have been due to windy conditions, as the species was also not detected during a concurrent survey of a reference site adjacent to the Cox River north of Wallerawang. Surveys by Wildthing (2002) found the Purple Copper Butterfly within 150 m of each of WSEA and ESEA, though not within them. Blackthorn was detected in the WSEA by Wildthing (2002) and two plants found in the WSEA were transplanted prior to clearing (A. Irwin, Senior Environmental Consultant, RW Corkery & Co Pty Limited pers.comm. 23/01/2017). During the field inspection undertaken for this report, Blackthorn was found in the WSEA surrogate plot. Therefore, the 1.9 ha of the WSEA is regarded as having been suitable habitat for the species.

Blackthorn was not found in the ESEA surrogate plot, nor within the vegetation monitoring plots to its north and west during surveys conducted in October 2016 (Lesryk Environmental 2016b). Therefore, the ESEA is not regarded having been potential habitat for the species.

Given the contiguity of habitat it is likely that the Purple Copper Butterfly did occur at the subject site. However, the habitat removed was part of a continuum of habitat within which the species has been recorded (OEH 2017a) that extends southwards from the Great Western Highway to Lake Lyell through more than 3,000 ha of bushland in Marrangaroo National Park, Lidsdale State Forest and adjoining private lands. Not all this vegetation represents habitat for the species as the abundance of Blackthorn varies greatly in response to vegetation type, fire history and level of disturbance (TSSC 2016).

It is likely that the action did result in a long-term decrease in the size of the population but to what degree is unknown.

- *reduce the area of occupancy of an important population;*

Clearing associated with the action has reduced the potential area of occupancy of the population by 1.9 ha.

- *fragment an existing important population into two or more populations;*

Clearing associated with the proposed action has marginally added to the fragmentation of habitat locally. It is considered unlikely that this would fragment the population into two or more populations, as alternative areas of movement are available around the quarry.

- *adversely affect habitat critical to the survival of a species;*

It is unclear whether habitat at the subject site is critical to the survival of the species.

- *disrupt the breeding cycle of an important population;*

Only a small area of potential breeding habitat of the Purple Copper Butterfly would have been affected by the action. Therefore, it is considered unlikely that its breeding cycle would be disrupted.

- *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;*

It is considered that there is extensive habitat beyond the study area such that local populations were unlikely to have decline significantly as a result of the action.

- *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;*

The recovery plan for the species (NPWS 2001) indicates that weeds can be a threat to the integrity of the species' habitat. Currently, there is no evidence that the clearing has resulted in weed invasion in those bushland areas adjacent to the WSEA or ESEA. Existing weeds such as Radiata Pine, predate the clearing of the subject site.

- *introduce disease that may cause the species to decline;*

No diseases have been identified as a threat to the Purple Copper Butterfly.

- *or interfere substantially with the recovery of the species.*

Given the provision of large areas of suitable habitat for the species in the vicinity of the study area, it is considered unlikely that the action significantly interfered with the recovery of the species.

Conclusion

In light of the discussion above, it is considered that the removal of 1.9 ha of habitat including an unknown number of individuals of the species may have had a significant impact on the Purple Copper Butterfly. Accordingly, a biodiversity offset plan that meets the credit requirements in the Biobanking credit report (Attachment 6) should be prepared. Contingent upon the implementation of such a plan, referral to the Federal Minister for the Environment to determine whether the Project is a controlled action requiring ministerial approval is not required.

5.1. (b) Spotted-tailed Quoll

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- *lead to a long-term decrease in the size of a population*

Whilst not detected during the current investigation, this species has been previously recorded in the vicinity of the subject site. The action removed 2.4 ha of native vegetation. Compared to the extent of similar resources being retained close to and beyond the limits of the subject site, the action is not considered to reduce the overall extent of habitat or foraging opportunities available to the Spotted-tailed Quoll, nor adversely affect the life cycle of this species such that there would be a long-term decrease in the size of the local population.

- *reduce the area of occupancy of the species*

The proposal would reduce the potential area of occupancy by 2.4 ha.

- *fragment an existing population into two or more populations*

Given the amount of vegetation removed, it is highly unlikely that the proposal has resulted in the fragmentation of a population of this species into two or more populations.

- *adversely affect habitat critical to the survival of a species*

No habitat critical to the survival of this species was recorded within the study area.

- *disrupt the breeding cycle of a population*

Given the retention of suitable habitat within, and beyond the limits of, the area investigated, it is considered unlikely that the action disrupted the breeding cycle of any potentially occurring Spotted-tailed Quoll populations.

- *modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

The action is unlikely to have removed, modified, fragmented or isolated a significant amount of Spotted-tailed Quoll habitat such that the long-term survival of this species was jeopardised. As similar and better quality habitat extends beyond the boundaries of the scope of work, including the nearby Marrangaroo National Park, it is considered that the removal of 2.4 ha of vegetation would not have had an impact on the Spotted-tailed Quoll such that the species is likely to decline.

- *result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*

The action is unlikely to have exacerbated the current situation where several invasive species (e.g. Radiata Pine) are present in the species' habitat.

- *introduce disease that may cause the species to decline*

The proposal is unlikely to introduce diseases that may cause the Spotted-tailed Quoll to decline.

- *interfere with the recovery of the species.*

A recovery plan has not yet been prepared for the Spotted-tailed Quoll. The proposal is not considered to interfere substantially with the recovery of this species.

Conclusion

It is unlikely that the action had a significant effect on the Spotted-tailed Quoll.

5.2 State - *Environmental Planning and Assessment Act 1979*

Under Part 1, Section 5A of this Act, an assessment (commonly referred to as the "seven-part test") must be made as to whether a proposed action is likely to have a significant effect on threatened species, populations or ecological communities, or their habitats. If a significant effect is likely, a Species Impact Statement must accompany the development application.

Based on the literature and database review and consideration of the likely habitat characteristics of the WSEA and ESEA prior to clearing, it is considered that the following species listed on the TSC Act wold have inhabited the subject site:

- Purple Copper Butterfly;
- Gang-gang Cockatoo;
- Powerful Owl;
- Barking Owl;
- Brown Treecreeper;
- Varied Sittella;
- Dusky Woodswallow;
- Scarlet Robin;
- Flame Robin;
- Spotted-tailed Quoll;
- Yellow-bellied Sheathtail-bat;
- Eastern False Pipistrelle; and
- Greater Broad-nosed Bat

As no areas of suitable aquatic habitat were present, no species listed as critically endangered, endangered or vulnerable on the NSW *Fisheries Management Act 1994* were considered likely to occur.

Each of the seven factors required to be considered when deciding if "there is likely to be a significant effect on threatened species, populations or ecological communities or their habitats" are addressed below. In line with the guidelines provided by OEH (then DECC) for the seven-part test (DECC 2007), some species have been grouped together due to a similarity in their habitat requirements.

5.2. (a) Purple Copper Butterfly 7-part Test

(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 Purple Copper Butterfly occurs above 850 m elevation, at sites with a south-west to north-west aspect, usually where direct sunlight reaches the habitat, and with extremes of cold such as regular winter snowfalls or heavy frosts. Geology, soils and dominant vegetation canopy species vary between habitat locations. However, vegetation structure is consistent, commonly open woodland or open forest with a sparse understorey that is dominated by the shrub, Blackthorn *Bursaria spinosa subsp. lasiophylla*, which is used as the larval food plant. Its lifecycle also relies on a mutualistic relationship with the ant, *Anonychomyra itinerans*. Butterflies of the species emerge between August

(later at higher altitude sites) and November, with a two-week peak of activity in September. After mating, the females lay eggs on or in the immediate vicinity of Blackthorn shrubs. After hatching, the larvae are attended by the ant *A.itinerans*, which shepherd them to and from Blackthorn plants, providing protection from predators and benefitting by receiving nutritional secretions from the larvae. New blackthorn growth is essential for the larvae and is promoted by post-disturbance conditions such as fire or tree falls which reduce overstorey shading. Without such disturbance, the blackthorn often becomes unsuitable habitat, and the Purple Copper Butterfly can become locally extinct. After fires, the Purple Copper Butterfly can boom in numbers, and spread throughout connected habitat, and possibly reoccupy or invade new areas of fresh blackthorn growth (DECCW 2010b, TSSC 2016).

It is not known whether the Purple Copper Butterfly occurred within the WSEA or ESEA. It was not detected during a targeted survey for the species in adjacent areas of the quarry during October 2016 (Lesryk Environmental Pty Ltd 2016a) but this may have been due to windy conditions, as the species was also not detected during a concurrent survey of a reference site adjacent to the Cox River north of Wallerawang. Surveys by Wildthing (2002) found the Purple Copper Butterfly within 150 m of each of WSEA and ESEA, though not within them. Blackthorn was detected in the WSEA by Wildthing (2002) and two plants found in the WSEA were transplanted prior to clearing (A. Irwin, Senior Environmental Consultant, RW Corkery & Co Pty Limited pers.comm. 23/01/2017). During the field inspection undertaken for this report, Blackthorn was found in the WSEA surrogate plot. Therefore, the 1.9 ha of the WSEA is regarded as having been suitable habitat for the species.

Blackthorn was not found in the ESEA surrogate plot, nor within the vegetation monitoring plots to its north and west during surveys conducted in October 2016 (Lesryk Environmental 2016b). Therefore, the ESEA is not regarded having been potential habitat for the species.

It is unclear how large the local population is and over what area it extends. However, the potential habitat removed (the 1.9 ha of the WSEA) was part of a continuum of habitat within which the species has been recorded (OEH 2017a). This extends southwards from the Great Western Highway to Lake Lyell through more than 3,000 ha of bushland in Marrangaroo National Park, Lidsdale State Forest and adjoining private lands. Not all this vegetation represents habitat for the species as the abundance of Blackthorn varies greatly in response to vegetation type, fire history and level of disturbance (TSSC 2016). However, although the action is likely to have removed some Blackthorn plants and possibly some individuals of the species, the area cleared would have been small in proportion to those occurring through the adjoining vegetation and the action would not have placed the local population of the species 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,

The Purple Copper Butterfly is an endangered species and as such populations of this species are not eligible to be listed as endangered.

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

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

The Purple Copper Butterfly is an endangered species, not an endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed,

Clearing associated with the action has reduced the potential area of occupancy of the population by 1.9 ha.

(ii) 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,

Given the extent of habitat around the subject site, it is considered unlikely that the action has resulted in a significant barrier to the movement of the species. It is unlikely habitat would be fragmented or isolated by the proposed action.

(iii) *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,*

The habitat removed may have been as important as any other similarly sized area within the locality. However, given the extent of this habitat, particularly in the large areas of bushland to the south in Marrangaroo National Park, it is considered unlikely that there would have been any effect on the long-term survival of the species in the locality.

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

Critical habitat is yet to be declared for the Purple Copper Butterfly.

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

A recovery plan has been prepared and approved for the Purple Copper Butterfly (NPWS 2001). The overall objective of the recovery plan is to stabilise the Purple Copper Butterfly status as an endangered species pursuant to the provisions of the TSC Act. The recovery program for the Purple Copper Butterfly aims to stabilise the population through the prevention of threatening processes, then to increase the *in-situ* population through habitat management, with the aim of downlisting (sic) the species to vulnerable (NPWS 2001).

The objectives of the threat abatement program for this species are to prevent the continuation of factors that are detrimentally affecting the Purple Copper Butterfly or its habitat, and to prevent the occurrence of activities that may affect the Purple Copper Butterfly or its habitat (NPWS 2001).

A relevant recovery action in the plan is: "For Purple Copper Butterfly sites or habitat potentially affected by a development or activity proposal, determination and consent authorities under the *Environmental Planning and Assessment Act 1979* and the *Native Vegetation Conservation Act 1997* shall have due regard to this recovery plan (including the environmental impact assessment guidelines included as Appendix 1)." The environmental impact assessment guidelines in Appendix 1 addressed factors in the repealed Section 5A of the EP&A Act (the 8-part test), relevant equivalents of which have been dealt with in this 7-part test.

Recovery plans are being replaced by the Saving our Species program (OEH 2017d). Under this program, the Purple Copper Butterfly has been assigned to the Site-managed species management stream. The subject site is not one of the three small management sites identified but is within the larger management site that covers the species' entire distribution. The objective of choosing this site is to secure the species at the site and ensure the population's viability in the long term.

The action was contrary to the objectives and actions of the recovery plan and the Saving our Species program.

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

"Clearing of native vegetation", is a listed key threatening process, the impact of which was increased by the action. It is considered unlikely that the operation of this threatening process on the subject site would have endangered the local population of the Purple Copper Butterfly.

Conclusion

In light of the above discussion, it is considered that the clearing of 1.9 ha of habitat containing an unknown number of individuals of the species, may have had a significant effect on the Purple Copper Butterfly, and its habitat. Accordingly, a biodiversity offset plan that meets the credit requirements in the Biobanking credit report (Attachment 6) should be prepared. Contingent upon the implementation of such a plan, the preparation of a Species Impact Statement is not required.

5.2. (b) Brown Treecreeper, Varied Sittella, Dusky Woodswallow, Flame Robin and Scarlet Robin

These five species are grouped together for the purpose of this assessment, as they have similar-sized territories and all require grassy woodlands for habitat.

(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 Brown Treecreeper inhabits eucalypt woodlands and dry open forest dominated by stringybarks or other rough-barked usually with an open grassy. Fallen timber is an important habitat component for foraging and hollows in standing dead or live trees and tree stumps are essential for nesting. The species breeds in pairs or co-operatively in territories which range in size from 1.1 to 10.7 ha (mean = 4.4 ha) (OEH 2017c). This species has not been detected on site to date but is known from similar habitat to the north near Mt Piper Power Station (OEH 2017a; author's field notes).

The Varied Sittella inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. It is a sedentary species though local nomadic movements have been reported. Densities have generally been estimated at between 0.2 – 0.9 birds/ha down to as little as 0.05 birds/ha. One study found a group five to eight ranging over 20ha (Blakers *et al.* 1984). The Varied Sittella was detected in October 2016 (Lesryk Environmental 2016b) in open forest near the creekline that runs below the WSEA.

The Dusky Woodswallow is usually found in woodlands and dry open sclerophyll forests characterised by an open understorey and a ground cover of grasses, and/or sedges or open ground, with coarse woody debris. Although Dusky Woodswallows have large home ranges, individuals may spend most of their time in about a 2 ha range and defend an area about 50 m around the nest (NSWSC 2016). It is a partial migrant in south-east Australia with reporting rates highest in summer months in the 1^0 latitude by 1^0 longitude cell in which the site occurs (Blakers *et al.*1994; Barrett *et al.* 2003). This species has not been detected on site to date but has been detected near Lidsdale (OEH 2017a).

The Flame Robin breeds in upland tall moist eucalypt forests and woodlands descending to dry forests, open woodlands and in pastures and native grasslands in winter (OEH 2017c). At nearby Bathurst in dry sclerophyll forest, breeding densities were 0.5 birds/ha (Blakers *et al.*1993). The species has been recorded along the Wallerawang-Rydal Road a few kilometres west of the subject

site (OEH 2017a), in what is mapped as Tableland Slopes Brittle Gum - Broad-leaved Peppermint Grassy Forest (DEC 2006).

The Scarlet Robin inhabits drier eucalypt forests and temperate woodlands, often on ridges and slopes, within an open understorey of shrubs and grasses and sometimes in open areas. Abundant logs and coarse woody debris are important structural components of its habitat. In autumn and winter, it migrates to more open habitats such as grassy open woodland or paddocks with scattered trees (OEH 2017c). Densities in eucalypt woodland range between 0.04 and 0.65 birds/ha. There are areas of overlap with the Flame Robin but the species occupy mutually exclusive territories with the Scarlet Robin generally preferring drier forest (Blakers *et al.* 1993). One male and one female Scarlet Robin were recorded foraging adjacent to the ESEA during the February 2017 survey and observed near the eastern boundary of the quarry during October 2016 (Lesryk Environmental 2016b).

Each of these species would have lost 2.4 ha of foraging habitat which may also have been used for breeding. Given the extent of similar suitable habitat to the south of the subject site, the local populations of these species are unlikely to have been placed at risk of extinction by the action.

(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*,

No populations of these species are listed as endangered.

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

(i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction*, or

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

These species are threatened species, not an endangered ecological community.

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

Assuming that the species inhabited the areas cleared by the action, 2.4 ha of habitat was removed.

(ii) *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*,

Given that alternative corridors for movement exist around the perimeter of the quarry, it is considered that the amount of clearing undertaken is unlikely to have affected the movement of these birds through the local area's bushland.

(iii) *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*,

It is considered that the habitat affected at the subject site is not of significance to these birds. The habitat type affected is well represented in the local area.

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

Species listed as vulnerable on the TSC Act are not eligible for critical habitat listing.

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

No recovery plans have been prepared for these species.

In the Saving our Species program (OEH 2017d), which replaces recovery plans, each of the species has been assigned to the Landscape management stream. This stream applies to species distributed across relatively large areas that are subject to threatening processes that generally act at the landscape scale (e.g. habitat loss or degradation) rather than at distinct, definable locations. A number of priority actions have been prepared for these woodland birds, none of which are directly relevant to the proposed action.

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

Clearing of native vegetation, Loss of hollow-bearing trees and Removal of dead wood and dead trees are listed key threatening processes the impact of which would have been increased by the action. However, they are unlikely to have significantly affected the local populations of the species.

Conclusion

The proposed action is unlikely to have had a significant effect on the Brown Treecreeper, Varied Sittella. Dusky Woodswallow, Flame Robin and Scarlet Robin, or their habitats.

5.2. (c) Powerful Owl and Barking Owl

These two owls are grouped together for the purpose of this assessment, as they occupy woodland and forest habitats.

(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,

Habitat for the Powerful Owl is widespread and primarily tall, moist productive eucalypt forests of the eastern tableland edge and the mosaic of wet and dry sclerophyll forests occurring on undulating gentle terrain nearer the coast. Optimal habitat includes a tall, shrub layer and abundant hollows supporting high densities of arboreal marsupials. The species roosts in groves of dense mid-canopy trees or tall shrubs in sheltered gullies, typically on wide creek flats and at the heads of minor drainage lines, but also adjacent to cliff faces and below dry waterfalls. Species commonly used for roosting include the She-Oaks *Allocasuarina* spp., rainforest species such as Coachwood (*Ceratopetalum apetalum*), Lilly Pilly (*Acmena smithii*) and Sassafras (*Doryphora sassafras*), Black Wattle (*Acacia melanoxylon*), Turpentine (*Syncarpia glomulifera*) and eucalypts. They nest in old hollow eucalypts in gullies and lower slopes within 100 m of streams or minor drainage lines, with hollows greater than 45 cm wide and greater than 100 cm deep. Home range has been estimated as 300-1500 ha according to habitat productivity (DEC 2006). The Powerful Owl has been recorded to the south of the subject site in this part of the Coxs River catchment within Marrangaroo National Park (OEH 2017a; author's field notes).

The Barking Owl inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Denser vegetation is used occasionally for roosting. During the day, it roosts along creek lines, usually in tall understorey trees with dense foliage such as *Acacia* and *Casuarina* species, or the dense clumps of canopy leaves in large Eucalypts. It requires tree hollows for nesting. Home range has been estimated as 225-6,000 ha (NPWS 2003; OEH 2017b). There are

several records of the species from east of Lidsdale and one record from between Little Hartley and South Bowenfels (OEH 2017a).

The Powerful Owl and Barking Owl are likely to have used the subject site as part of their local foraging territories which would be in the range of 800 ha or more. While there may have been suitable hollows present, there is no roosting habitat for either species near the subject site.

In relation to their foraging requirements, it is considered unlikely that prey populations would have been affected to a degree such that the local owl populations would have been 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,

No populations of the Powerful Owl or Barking Owl are listed as an endangered.

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

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

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

The Powerful Owl and Barking Owl are threatened species, not an endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed,

2.4 ha of habitat was removed by the action.

(ii) 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,

The proposed action would have removed a relatively small amount of habitat that would be easily traversed by these two owls. Both owls are known to traverse open space areas and urban infrastructure (authors field notes). It would not have resulted in isolation or fragmentation of habitat.

(iii) *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,*

It is considered that the habitat affected by the action is not of major importance to either the Powerful Owl or Barking Owl. This is because it is unlikely to be used for roosting or nesting and the type of foraging habitat available is well represented in surrounding areas. Given this, the level of modification caused by the action is unlikely to affect the long-term survival of these species in the locality.

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

The subject site is not registered as critical habitat.

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

A recovery plan for the Large Forest Owls (which includes the Powerful Owl) has been prepared (DEC 2006). The overall objective of the plan is to ensure that the three species persist in the wild in NSW in each region where they presently occur.

Specific recovery objectives, within the Powerful Owl recovery plan that are relevant to the proposal are:

- *To minimise further loss and fragmentation of habitat outside conservation reserves and State forests by protection and management of significant owl habitat (including protection of individual nest sites).*
- *To minimise the impacts of development activities on large forest owls and their habitats outside conservation reserves and State forests.*
- *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 so doing increase the information base about owl habitats and biology.*

Only a small area of habitat was affected by the action and it is considered that this would not have been to a degree where local prey populations were affected. The species is unlikely to have roosted or nested at the subject site.

The applicant has been apprised of the presence of this and other threatened species in the locality.

A draft recovery plan was prepared for the Barking Owl (NPWS 2003) but was never finalised.

In the Saving our Species program (OEH 2017d), which replaces recovery plans, both species have been assigned to the Landscape management stream. This stream applies to species distributed across relatively large areas that are subject to threatening processes that generally act at the landscape scale (e.g. habitat loss or degradation) rather than at distinct, definable locations. Several priority actions have been prepared for these owls, none of which are directly relevant to the proposed action.

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

The Proposal involves "clearing of native vegetation" and "removal of dead wood and trees", which are listed as a Key Threatening Processes.

Conclusion

Based on the above discussion, the action is unlikely to have had a significant effect on the Powerful Owl and Barking Owl, or their habitats.

5.2. (d) Gang-gang Cockatoo Seven-part Test

(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 Gang-gang Cockatoo inhabits forests and woodlands where it forages on seeds of eucalypts and Acacias. It may also forage on introduced plants such as Cotoneaster, Quince etc. It nests in tree hollows with an internal diameter of around 25 cm that are in large live or dead eucalypts often near water. Breeding takes place between October and January. Populations can be seasonally nomadic

moving from highland areas to the coast and lowlands during autumn-winter (OEH, 2017b; Pizzey, 1997).

Given the abundance of hollow-bearing trees in the surrounding bushland, it is considered unlikely that the species would have used hollow-bearing trees that were be removed by the action. The species may have foraged on eucalypts within the site's woodlands on occasions. Given the extent of this habitat resource in the surrounding bushland, it is considered that the loss of approximately 2.4 ha of foraging habitat would not have placed the local population 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,

The subject population of the Gang-gang Cockatoo is not listed as an endangered population.

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

(i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

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

The Gang-gang Cockatoo is a threatened species not an endangered ecological community.

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

2.4 ha of habitat was removed by the action.

(ii) 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,

The site is within a large continuum of habitat that surrounds the site. The modification of a small area would not fragment or isolate habitat of the Gang-gang Cockatoo.

(iii) 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,

Whilst some habitat for the species would be lost substantial areas of habitat occur outside the site.

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

Critical habitat for the Gang-gang Cockatoo is yet to be declared.

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

Under the Saving our Species program (OEH 2017d), this species has been assigned to the Landscape species management stream. Management actions under the program that are relevant to the action are:

- Protect known and potential remnant Gang-gang Cockatoo habitat, particularly tall wet forest and dry sclerophyll forest vegetation communities with large trees supporting hollows that are

10 cm in diameter or larger and manage these areas to allow ongoing regeneration of local native trees, shrubs and ground layer plants. Where possible, negotiate management agreements with landholders that are funded in perpetuity that allows ongoing recruitment of native local trees, shrubs and grasses.

- Restore Gang-gang Cockatoo habitat in strategic locations close to known habitat and movement corridors, using appropriate local tree, shrub and ground cover species. Care must be taken to ensure that the removal of exotic berry-bearing shrubs and trees such as Cotoneaster, hawthorn and pyracantha, that provide foraging habitat, is compensated for by planting of appropriate native foraging plant species such as acacias and eucalypts.

Whilst the first of these would have been contravened by the action, the provision of compensatory habitat would conform to the second.

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

"Clearing of native vegetation and "Loss of hollow-bearing trees" are listed key threatening processes the impact of which would have been increased by the action. It is considered unlikely that the operation of these processes on the subject site would have endangered the local populations of this species.

Conclusion

It is considered that the proposed development would not have a significant effect on the Gang-gang Cockatoo, or its habitat.

5.2. (e) Spotted-tailed Quoll

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 Spotted-tailed Quoll is a cat-size carnivore that occurs in a wide range of habitats including sclerophyll forest and woodlands, heath and rainforest. It takes a range of prey including arboreal and terrestrial mammals, macropods, birds and insects and occasionally raids poultry houses. Females occupy home ranges up to about 750 ha and males up to 3500 ha (OEH 2017b). Whilst there are no records of better than 10 km accuracy within 10 km of the subject site OEH 2017a), the species is likely to inhabit the vast tracts of bushland in this part of the Cox River catchment between the Great Western Highway and Lyell Dam.

The Spotted-tailed Quoll may occasionally have used the subject site as part of large foraging territory. It is unlikely that prey populations would have been affected by clearing for either the ESEA or WSEA to a degree that would have affected the local population of the Spotted-tailed Quoll.

(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*,

The subject population of the Spotted-tailed Quoll is not listed as an endangered population.

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

(i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

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

The Spotted-tailed Quoll is a threatened species not an endangered ecological community.

(d) *in relation to the habitat of a threatened species, population or ecological community*:

(i) *the extent to which habitat is likely to be removed or modified as a result of the action proposed*,

2.4 ha of foraging habitat was removed by the action.

(ii) *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*,

The site is within a large continuum of habitat that extends east and south of the subject site. The modification of a small area would not fragment or isolate habitat of the Spotted-tailed Quoll.

(iii) *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*,

The amount of habitat that would be removed or modified represents a very small proportion of a Spotted-tailed Quoll foraging territory. It is considered unlikely that prey populations on the site would decline such that the local quoll population would be affected.

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

Critical habitat for the Spotted-tailed Quoll is yet to be declared.

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

No recovery plan or threat abatement plan has been prepared for this species. Under the Saving Our Species program, OEH (2017d) is currently developing a targeted approach for managing species, such as the Spotted-tailed Quoll, that are subject to threatening processes that generally act at the landscape scale. In the interim, management actions have been identified for this species, none of which are of relevance to the action.

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

Clearing of native vegetation, Loss of hollow-bearing trees and Removal of dead wood and dead trees are listed key threatening processes the impact of which would have been increased by the action. However, they are unlikely to have affected the local population of the species.

Conclusion

It is considered that the action would not have had a significant effect on the Spotted-tailed Quoll, or its habitat.

5.2. (f) Yellow-bellied Sheathtail-bat, Greater Broad-nosed Bat and Eastern False Pipistrelle Seven-part Test

(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,

Each of these species use tree hollows for roosting. The Greater Broad-nosed Bat hunts for insects, particularly beetles, at forest edges. The Yellow-bellied Sheathtail-bat inhabits a wide variety of habitats generally flying high and fast above the canopy foraging on beetles, grasshoppers, shield bugs and flying ants. The Eastern False Pipistrelle hunts beetles, moths, weevils and other flying insects above or just below the tree canopy (Churchill 2008, OEH 2017b).

The Yellow-bellied Sheathtail-bat was recorded at the quarry site by Wildthing (1998). The Eastern False Pipistrelle was recorded elsewhere in this part of the Coxs River catchment (OEH 2017a, author's field notes) and the Greater Broad-nosed Bat has been recorded near Lidsdale (OEH 2017a).

These species may have roosted in tree hollows that are quite common in the local bushland and presumably within the area that was cleared. However, given the abundance of this habitat component in surrounding bushland, and that there are likely to be numerous other non-threatened hollow-dependent bats in the locality, it is considered that the likelihood of these species using hollow-bearing trees at the subject site would have been low and their removal is unlikely to have affected the local populations.

The amount of insect-attracting vegetation (foraging habitat) affected is not significant in relation to the wider local distribution of these three microbats. The action is unlikely to have placed local populations of these species 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,

The local population of these species are not listed as endangered.

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

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

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

The species are threatened species and are not an endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed,

Approximately 2.4 ha of foraging habitat, which was likely to have supported some roosting habitat, was removed by the action.

(ii) 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,

Each of these species is highly mobile and unlikely to be affected in its local movements by the minor modifications to habitat represented by the action.

(iii) *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,*

In relation to the local distribution of these species' habitat, the habitat that was removed is not considered significant. The habitat removed (wooded areas with tree hollows) is widespread in the locality, particularly in the large areas of bushland surrounding the site. Given the level of modification and the abundance of habitat locally, it is considered that there is unlikely to be an effect on the long-term survival of these three species 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*, endangered ecological communities, species and populations are eligible for critical habitat listing. As the subject species are all listed as vulnerable, they are not eligible for critical habitat listing.

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

No recovery plans have been prepared for these species. In the Saving our Species program (OEH 2017d), which replaces recovery plans, each of the species has been assigned to the Landscape management stream. This stream applies to species distributed across relatively large areas that are subject to threatening processes that generally act at the landscape scale (e.g. habitat loss or degradation) rather than at distinct, definable locations. Numerous priority actions have been prepared for these microbats, none of which is directly relevant to the proposed action.

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

Clearing of native vegetation and Loss of hollow-bearing trees are listed key threatening processes the impact of which would have been increased by the action. It is considered unlikely that the operation of these processes on the subject site would have endangered the local populations of these species.

Conclusion

The action is unlikely to have had a significant effect on the Yellow-bellied Sheathtail-bat, Greater Broad-nosed Bat or Eastern False Pipistrelle, or their habitats.

Attachment 6. BioBanking Credit Report