

**Flora and Fauna Assessment
(RPS, 2012)**



Flora and Fauna Assessment

Proposed Surface Mine Dewatering Facility Bore 8 Springvale Colliery

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Executive Summary

RPS Australia East Pty Ltd (RPS) was engaged by Centennial Springvale Pty Ltd to undertake a Flora and Fauna Assessment for the construction an additional surface mine dewatering facility (Bore 8) and associated road infrastructure (the Project), within Newnes State Forest.

Ecological investigations included diurnal field studies and desktop assessments over the 'Study Area' as conducted by RPS. The 'Study Area' is comprised of the 'Project Application Area' (the impact areas associated with the construction of the dewatering bore site and access track) and the surrounding areas which were surveyed in order to inform the design of the access route and dewatering bore. The surveys conducted throughout the Study Area included diurnal bird surveys, targeted surveys for threatened plants, location of hollow-bearing trees and delineation of Threatened Ecological Communities (TECs) within the Study Area. Desktop investigations represented the results as contained in the Atlas of NSW Wildlife (NSW NPWS) and the records obtained from the Protected Matters search tool (SEWPAC). In addition, records were added from other ecological investigations from the area (Denny 2004a, 2004b, 2005, 2006a, 2006b, 2007a, 2007b, 2008a, 2008b, 2008c, 2009, 2010a, 2010b, 2010c, 2010d, 2010e, 2011a, 2011b, 2011c, 2011d, RPS 2010).

This assessment aims to examine the likelihood of the Project to impact upon any threatened species, populations or ecological communities listed within the *Threatened Species Conservation Act 1995 (TSC Act 1995)*. This report recognises the relevant requirements of the *Environmental Planning and Assessment Act 1979 (EP&A Act 1979)* as amended by the *Environmental Planning and Assessment Amendment Act 1997 (EP&AA Act 1997)*. Assessment is also made with regard to those threatened entities listed federally under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999)*.

VEGETATION

Four vegetation communities were recorded within the Study Area (ground-truthed mapping after DEC 2006), including:

- MU 30 Exposed Blue Mountains Sydney Peppermint-Silvertop Ash Shrubby Woodland;
- MU 28 Sandstone Plateau and Ridge Scribbly Gum Silvertop Ash Shrubby Woodland;
- MU 26 Newnes Plateau Narrow Leaved Peppermint- Silvertop Ash Layered Open Forest; and
- MU 7 Newnes Plateau Narrow Leaved Peppermint- Mountain Gum- Brown Stringybark Layered Forest.

A total of 4 ha of native vegetation will be cleared for this Project, with 2.34 ha of this area to be rehabilitated after the initial construction phase.

Significant Flora

A number of threatened flora species were targeted during flora investigations. These investigations found that 93 individual *Persoonia hindii*, a species listed as Endangered under the *TSC Act 1995*, were likely to be removed as a result of this Project.

Fauna Habitat

Open Forest habitat occurred across all the Study Area along with several outcrops of Hanging Swamp, which provides potential fauna habitat to a range of birds, amphibians, reptiles and invertebrates. A relatively low density of hollow-bearing trees occurred across the Study Area, as a consequence of past logging disturbance, however habitat still occurs for arboreal marsupials, hollow dependent microchiropteran bat fauna and large forest owls. No hollow bearing trees were recorded within the development footprint for this Project.

The understorey diversity and habitat complexity is relatively high and would provide habitat for small native mammals including *Antechinus* and for small insectivorous and nectivorous birds.

Significant fauna

A range of threatened fauna species occur within the Study Area and its surrounds, including the Gang Gang Cockatoo (*Callocephalon fimbriatum*), Scarlet Robin (*Petroica boodang*), Flame Robin (*Petroica phoenicea*) and Masked Owl (*Tyto novaehollandiae*). Due to the high degree of connectivity to surrounding habitat and the limited amount of clearing for this Project, no significant impact on any threatened fauna is expected.

CORRIDORS AND HABITAT LINKAGES

The Project will be located within contiguous wooded habitats of the Newnes Plateau, an area of native vegetation covering ~25,000 hectares. The location of the proposed surface mine dewatering facility and associated infrastructure has been designed to minimise the impact on the ecology of the area through having the smallest possible footprint and to avoid the majority of the *P. hindii* population, hollow-bearing trees and areas of Newnes Plateau Hanging Swamp.

ENVIRONMENTAL LEGISLATION ASSESSMENT

Section 5A of the EP&A Act 1979

Assessment of potential impacts likely to be associated with the Project Application Area and the ecological requirements of locally occurring native flora and fauna found that no threatened species, population or community is likely to be adversely affected by proposed geotechnical works, provided that adequate sediment controls (as developed by GSSE (2012)) are established and areas of *P. hindii* are avoided to a level that is unlikely to significantly impact upon the local population.

Key Threatening Processes

Key Threatening Processes (KTPs) are listed in Schedule 3 of the *TSC Act 1995*. Six KTPs have the potential to affect the Project Application Area as a consequence of the Project, being:

- Infection of native plants by *Phytophthora cinnamomi*;
- Removal of native vegetation ;
- Removal of dead wood and trees;
- Anthropogenic climate change;
- Loss of hollow-bearing trees; and
- Alternation to the natural flow regimes of rivers, streams, floodplains and wetlands.

No other KTPs are believed to be likely as a consequence of the proposed surface mine dewatering facilities. Due to the small scale of the Project, it is not expected that it will significantly contribute towards any KTP.

SEPP 44 'Koala Habitat Protection'

One Koala feed tree species (*Eucalyptus viminalis*) occurred across the Study Area, however the density of *E. viminalis* (<15%) suggest that the Study Area is not core Koala habitat as defined in SEPP 44.

EPBC Act 1999

Five threatened fauna species, no threatened flora species and no TEC are considered to potentially occur within the Study Area. No significant impacts are expected to occur on any of the threatened fauna species provided the mitigation measures stipulated within this report are adhered to.

CONCLUSIONS AND RECOMMENDATIONS

The proposed dewatering borehole location and associated access track has been designed based on minimum impact to significant surface features.

The access road to Bore 8 is mostly already formed and it was considered that the least sensitive route was to utilise existing alignment as the constraints of *P. hindii* are present on both sides of the track and realignment will not result in a significant difference in impacts.

One threatened flora species and two threatened bird species listed under the *TSC Act 1995* have been recorded within the Study Area during recent surveys (RPS 2011 and 2012) whilst an additional 23 threatened species have been identified in the locality during monitoring work by Martin Denny. Habitat within the Project Application Area is considered suitable for several other threatened species that may use the area on an intermittent basis.

93 individual *P. hindii* are proposed to be removed in this Project, representing the removal of less than 0.8% of the known population of approximately 12,000 individuals that are located within 2.8km of the Study Area.

A significant impact is considered unlikely to occur to any species, population, or endangered ecological community as a result of the proposal.

Recommendations

The following recommendations have been outlined to provide ecological guidelines and Study Area management strategies that may prevent any ongoing detrimental impacts upon habitat surrounding the proposed surface mine dewatering facilities.

- Sediment and erosion control should be a focus when undertaking access track upgrade;
- During removal of habitat trees an environmental representative or ecologist should be present to ensure that fauna are handled appropriately;
- Any hollow-bearing trees removed by clearing activities along with valuable fauna habitat within displaced ground debris should be retained and collected for fauna conservation activities off-site;
- Hollow-bearing trees adjacent to the impact footprint should be retained where possible;
- Populations of *P. hindii* should be avoided where possible;
- All disturbed areas outside of the impact footprint should be rehabilitated with endemic native vegetation;
- Adequate sediment control be employed adjacent to all areas of soil disturbance; and
- Appropriate measures should be employed to ensure that machinery utilised for the Project are free of materials (soils etc.) such that they do not infect vegetation within the Study Area with *Phytophthora cinnamomi*, or cause the distribution of weed species.

Terms and Abbreviations

Abbreviation	Meaning
DECCW	NSW Department of Environment, Climate Change and Water (now OEH)
OEH	Office of Environment and Heritage
DP&I	NSW Department of Planning and Infrastructure
<i>EP&AA Act 1979</i>	<i>Environmental Planning and Assessment Act 1979</i>
<i>EP&AA Act 1997</i>	<i>Environmental Planning and Assessment Amendment Act 1997</i>
<i>EPBC Act 1999</i>	<i>Commonwealth Environment Protection Biodiversity Conservation Act 1999</i>
ha	hectare
RPS Australia East Pty Ltd	RPS
SEWPAC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
TEC	<i>Threatened Ecological Community</i>
<i>TSC Act 1995</i>	<i>NSW Threatened Species Conservation Act 1995</i>

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I.0 Introduction

RPS Australia East Pty Ltd (RPS) was engaged by Springvale Coal Pty Ltd to undertake a Flora and Fauna Assessment for a proposed surface mine dewatering facility (Bore 8), as well as associated infrastructure (power and water pipelines) and an access road within the Springvale mining lease area (herewith referred to as 'the Study Area'). The 'Study Area' is comprised of the 'Project Application Area' (the impact areas associated with the construction of the dewatering bore site and access track) and the surrounding areas which were surveyed in order to inform the design of the access route and dewatering bore. This included the mapping of the buffer areas surrounding the track alignment and dewatering bore pad area of approximately 120m x 120m.

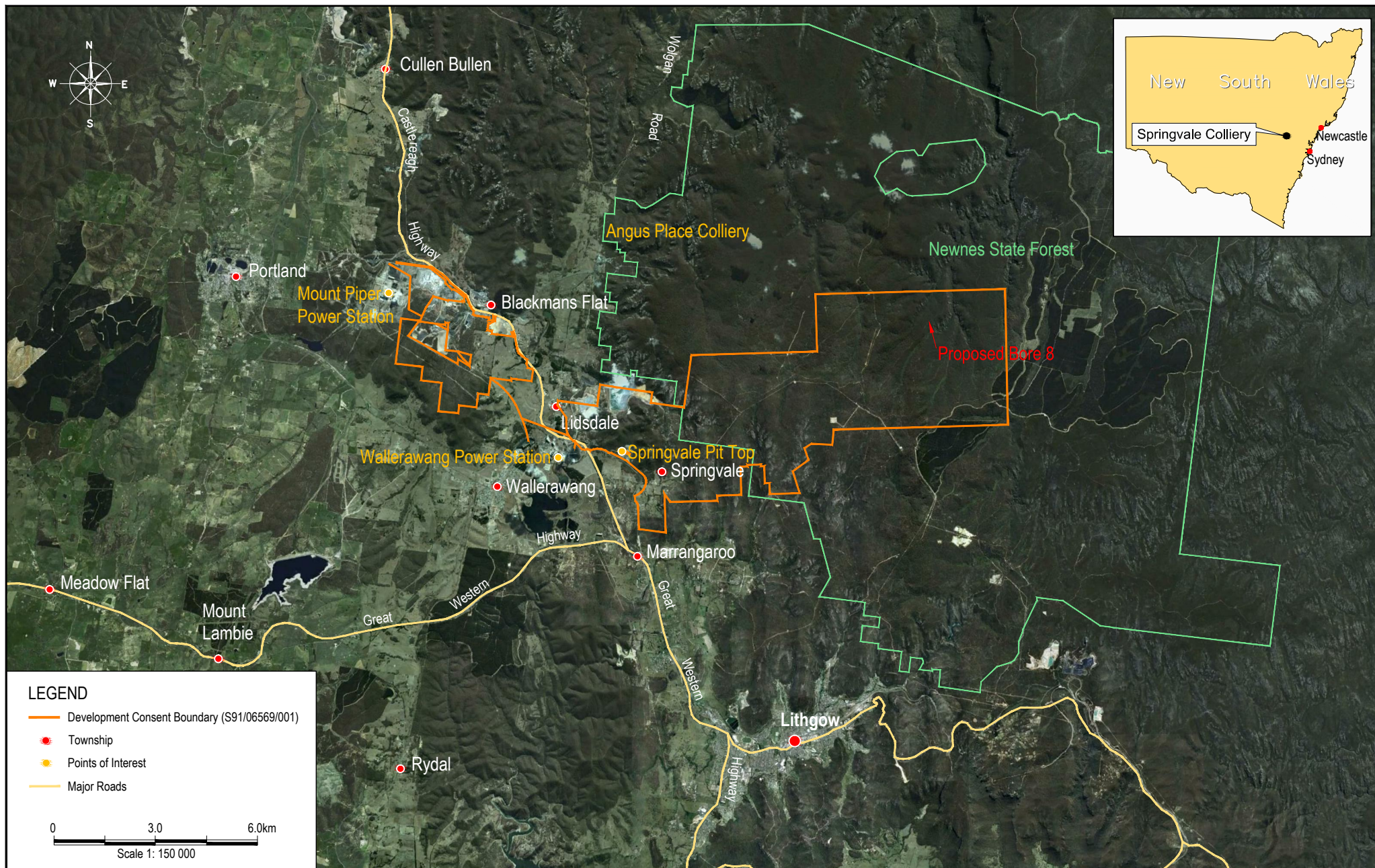
The Project Application Area consists of an access track of which the entire length is along an existing track; however it will require widening from approximately 3m to 10m. The area of impact at the pad site is going to be 1.44 ha. Areas within the initial development footprint of the access track to be decommissioned after the construction phase (including the reduction in width of the access track from 10m to 5m) will be rehabilitated with native, endemic vegetation. Therefore, 2.34 ha of the vegetation clearing will only be a temporary impact.

The borehole location and its proposed access track was investigated in order to assess the potential for supporting threatened species, populations and ecological communities known or likely to occur within the region. These field investigations were used to examine the likelihood of any significant impact of the proposed dewatering bore and associated infrastructure on any threatened species, populations or ecological communities listed within the *Threatened Species Conservation Act 1995 (TSC Act 1995)*. This report recognises the relevant requirements of the *Environmental Planning and Assessment Act 1979 (EP&A Act 1979)* as amended by the *Environmental Planning and Assessment Amendment Act 1997 (EP&AA Act 1997)*. Assessment is also made with regard to those threatened entities listed federally under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999)*.

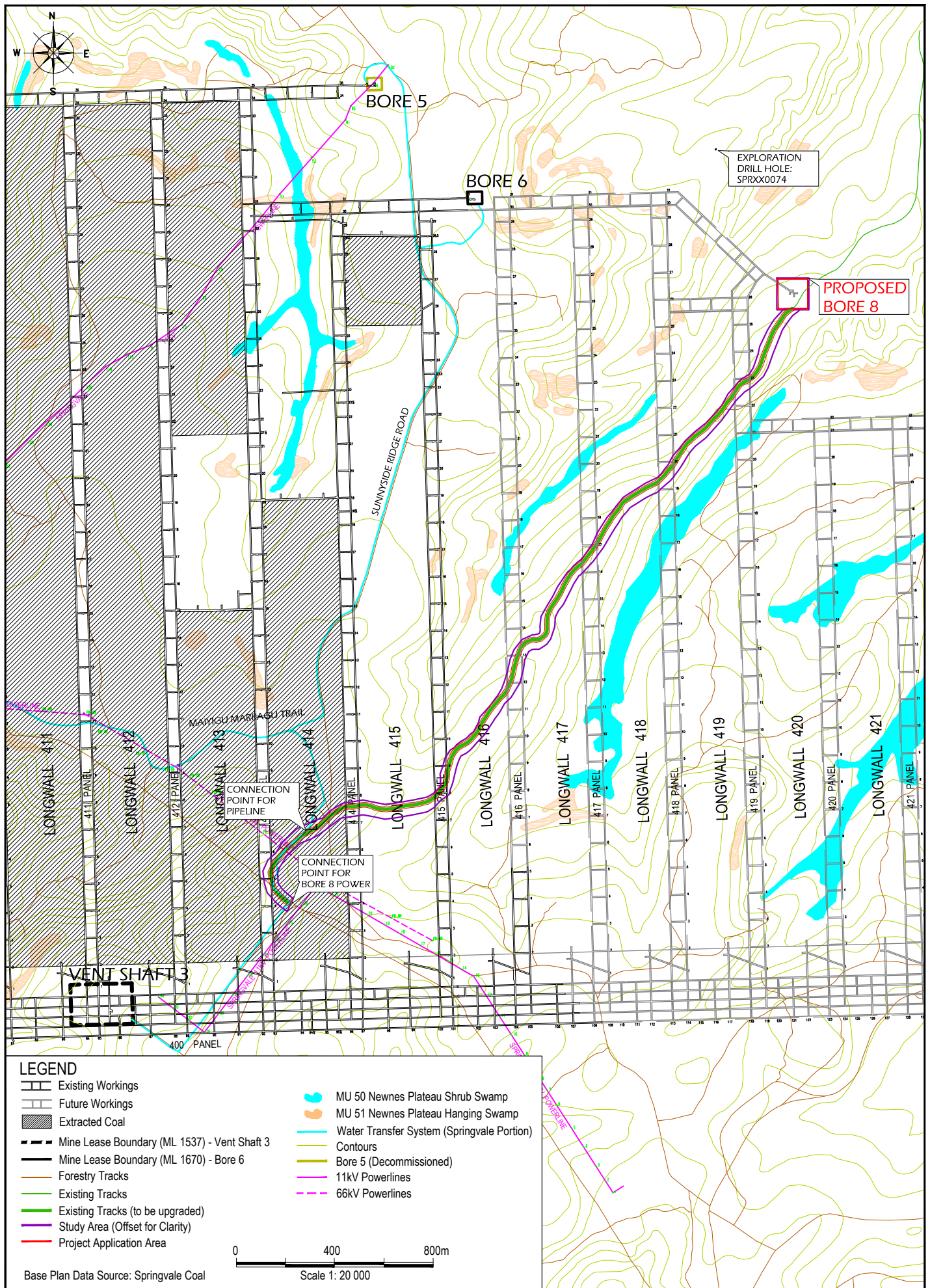
Figure 1-1 shows the regional location of the project.

Figure 1-2 shows the Project Application Area and project design.

Figure 1-3 shows an aerial photo of the study area.



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V:\CCC15-005\Figures\Final\CAD\RPS_120904\Fg1-2_CCC15-005_Project Application Area_120904.dwg
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Springvale Colliery
Project Application Area

FIGURE 1-2

WARNING
No part of this plan should be used
for critical design dimensions.
Confirmation of critical positions
should be obtained from RPS Newcastle.

Legend

 Study Area

 Existing Track

 New Track Alignment

N



0 400 800m

SCALE: 1:15,000 AT A4 SIZE

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TITLE: FIGURE 1-3: STUDY AREA
AERIAL PHOTO

LOCATION: SPRINGVALE
DEWATERING
BORE 8

DATUM: GDA 94
PROJECTION: MGA ZONE 56

DATE: 04/09/2012
PURPOSE: REPORT FIGURE

LAYOUT REF: 3:\JOBS\Centennial\All Jobs\110382 Springvale
Dewatering Bore 8 & 9\Drafting\
Workspaces\Eco
VERSION (PLAN BY): A A4 (PH)

CLIENT: CENTENNIAL SPRINGVALE
JOB REF: 110382

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RPS

1.1 Study Area Particulars

Locality – Springvale Mine, Newnes Plateau NSW

LGA – Lithgow City Council.

Area – The total area considered covers 19.3ha (the Study Area), which includes the proposed dewatering bore site of 120m x 120m and the access track with associated buffer on either side.

Boundaries – The Study Area is wholly within the Springvale Coal mining lease.

Current Land Use – The Study Area lies with the Newnes State Forest Estate, an area of State Forest that covers ~25,000 hectares.

Topography – The Study Area is situated on the lower and mid-slopes of the small valley formed by a perennial drainage line.

Vegetation – The proposed dewatering bore site and access track is located within remnant vegetation that is selectively logged under State Forest tenure. Vegetation communities within the immediate area as described in DEC (2006) include Exposed Blue Mountains Sydney Peppermint – Silvertop Ash Shrubby Woodland, Newnes Plateau Narrow-leaved Peppermint – Silvertop Ash Layered Open Forest, Newnes Plateau Narrow-leaved Peppermint – Mountain Gum – Brown Stringybark Layered Forest and Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland.

1.2 Description of the Project

An additional surface mine dewatering facility (Bore 8) is to be established ahead of current mine workings as the workings progress east along the coal seam, to ensure water levels in the mine are safely maintained at manageable levels. The Project Application Area has been selected to suit the anticipated seam floor contours as well as the proposed mine layout and topography for surface infrastructure.

A low level of impact is expected due to the clearing works required for the bore pad, access track, powerline and pipeline installation. Large construction and maintenance machinery will be operated in these areas but are expected to have minimal impacts.

1.3 Scope of the Study

The scope of this flora, fauna and ecological constraints assessment report is to:

Undertake a desktop review of previous ecological assessments (with regard to recorded threatened species) located in the vicinity of the Study Area and to also review records of threatened species from the NSW Atlas of Wildlife and a SEWPAC Protected Matters Search;

- Identify vascular plant species found within the Study Area;
- Identify and map existing vegetation communities;
- Assess the status of identified plant species and vegetation communities under relevant legislation;
- Identify existing habitat types within the Study Area and assess the habitat potential for threatened

species, populations, or ecological communities known from the proximate area;

- Through preliminary research identify threatened fauna potentially using the Study Area;
- Employ targeted habitat survey techniques to identify fauna, in particular threatened species potentially using the Study Area; and
- Assess the potential of the Project to have a significant impact on any threatened species, populations or ecological communities identified during field surveys or as having potential habitat in the Study Area.

Whilst survey work has been undertaken within the bounds of the Study Area (as outlined in Section 1.0), consideration has been afforded to areas within the surrounding landscape in order to appreciate the environmental context at a regional scale. This has included assessment of potential indirect impacts.

The purpose of this report is to:

- Ensure planning, management and development decisions are based on sound scientific information and advice by documenting the presence of any biodiversity components or potential significant impacts that may exist within the Study Area; and
- Provide information to enable compliance with applicable assessment requirements contained within the *TSC Act 1995*, *EP&A Act 1979*, the Commonwealth *EPBC Act 1999*, and any other relevant state, regional and local environmental planning instruments.

I.4 Qualifications and Licensing

Qualifications

This report was written by Arne Bishop BEnvSc, Chris McLean BEnSc (hons), PhD candidate and Joel Stibbard BSc and reviewed by Paul Hillier BEnvSc and Toby Lambert BEnvSc of RPS. The academic qualifications and professional experience of all RPS consultants involved in the Project are documented in Appendix 3.

Licensing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence S100536 (Valid 31 December 2012);
- Animal Research Authority (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2013);
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2013); and
- Certificate of Accreditation of a Corporation as an Animal Research Establishment (Trim File No: 01/1522 & Ref No: AW2001/014) issued by NSW Agriculture (Valid 22 May 2014).

2.0 Methodology

A variety of field survey techniques were employed over the course of fieldwork for this assessment to record the suites of flora species and the fauna guilds likely to occur across the Study Area.

Trapping and other intensive survey techniques were not conducted due to the occurrence of extensive previous survey work on the Newnes Plateau by RPS and others (see Denny 2004a, 2004b, 2005, 2006a, 2006b, 2007a, 2007b, 2008a, 2008b, 2008c, 2009, 2010a, 2010b, 2010c, 2010d, 2010e, 2011a, 2011b, 2011c, 2011d). These surveys were undertaken in accordance with guidelines outlined in DEC (2004a). Targeted habitat searches and assessment of previous surveys were used to assess the Study Area in place of trapping surveys.

2.1 Flora Survey

2.1.1 Vegetation Mapping

Flora surveys and vegetation mapping carried out within the Study Area has been undertaken. The vegetation mapping comprised mapping from the survey undertaken for this Project plus data from previous mapping as follows.

Review of previous ecological works in the vicinity of the Study Area include:

DEC (2006). *The Vegetation of the Western Blue Mountains*. Unpublished report funded by the Hawkesbury – Nepean Catchment Management Authority. Department of Environment and Conservation, Hurstville.

RPS (2010). *Flora and Fauna Assessment for Proposed Longwalls 910 and 900W*. Report for Centennial Angus Place Colliery, RPS, Newcastle.

2.1.2 Vegetation survey

This survey required confirmation of the community type(s) present (based on dominant species) by undertaking flora surveys and community identification throughout the Study Area.

Flora surveys were conducted throughout the Study Area, with an emphasis on potentially significant species as outlined below. The flora survey also included the consideration of the Study Area in line with methodology such as the “Random Meander Technique” described by Cropper (1993).

Map the type and general extent of the community(s) present into definable map units where appropriate.

2.1.3 Survey Limitations

Timing limitations are often encountered during ecological surveys due to the seasonality of activity and detectability for a number of flora and fauna species being studied. There is a range of common albeit cryptic plant species that have a brief flowering period and hence small ‘window’ of effective detectability. In addition, the seasonality of surveys also places limits on the number of flora species identified in the

Study Area. Therefore, some threatened species not detected cannot be discounted off-hand due to seasonality and other factors, and are therefore addressed in terms of their potential for occurrence within the Study Area based on ecological factors. As such, the precautionary principle is applied and for some species, where appropriate, assumed presence is made for assessment purposes.

2.1.4 Significant Flora Survey

A list of potentially occurring significant flora species from the locality, specifically the Project Application Area, (>10km radius) was compiled, which included threatened species, populations and ecological communities listed under the *TSC Act 1995*, those species listed under the *EPBC Act 1999*, as well as any other species deemed to be of local importance.

A detailed survey of the threatened species *Persoonia hindii* was undertaken once the plant was first observed. This was undertaken to ensure appropriate consideration of its location as part of the impact assessment and to inform potential project refinement if required.

2.2 Habitat Survey

An assessment of the relative value of the habitat present within the Study Area was carried out. This assessment focused primarily on the identification of specific habitat types and resources favoured by known threatened species from the region. The assessment also considered the potential habitat value of the Study Area (and surrounds) for all major guilds of native flora and fauna.

Habitat assessment was based on the specific habitat requirements of each threatened fauna species in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements. Consideration was given to contributing factors including topography, soil, light and hydrology for threatened flora and assemblages.

2.3 Fauna Survey

The fauna survey methodology initially consisted of the review of existing ecological surveys conducted on the Newnes Plateau, especially with regard to recorded threatened species. This information based on searches on the NSW Atlas of Wildlife and a SEWPAC Protected Matters Search provided a baseline for which fauna species are expected to occur on or in the vicinity of the Study Area. Combined with an opportunistic diurnal fauna survey of the Study Area, an observed and expected fauna species list for the area was able to be compiled from these records (Appendix 1). An assessment of the potential use of the Study Area by threatened fauna species (as listed under the *TSC Act 1995* and the *EPBC Act 1999*) was undertaken based on these records.

2.3.1 Avifauna Survey

The presence of avifauna within the Study Area was carried out via opportunistic diurnal observations during Study Area fieldwork visits. Birds were identified by direct observation or by recognition of calls or distinctive features such as nests, feathers, and owl regurgitation pellets etc. The potential for threatened avifauna to use the Study Area was also assessed by habitat attributes occurring within the Study Area and their capacity to support threatened species that are known to occur in the wider locality. Assessment of the Study Area's potential to provide opportunities for Large Forest Owl species was based on previous

records of Large Forest Owls on the Newnes Plateau and supported through knowledge of the known habitat requirements of these species (Kavanagh et al. 1995, Kavanagh and Bambkin 1995, Kavanagh and Stanton 1998).

2.3.2 Herpetofauna Survey

Opportunistic diurnal amphibian and reptile searches were conducted during the survey. Known occurrences of threatened herpetofauna species from the region were taken into account during assessment of habitat, to determine the potential for the Study Area to support such species.

2.3.3 Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of resident fauna were noted. Such indicators may include:

- Distinctive scats and scents left by mammals.
- Nests made by various guilds of birds;
- Potential whitewash, regurgitation pellets and prey remains from owls;
- Skeletal material of vertebrate fauna;
- The calls of fauna; and
- Footprints and tracks.

Any other incidental observations of fauna were recorded during all phases of fieldwork.

3.0 Results

The prevailing weather conditions during the survey periods are presented in Table 3-1 below.

Table 3-1: Prevailing Weather Conditions

	DATE		
	4/7/11	31/10/11 – 4/11/11 (Average)	19/1/12
Min. Temperature	6.8°C	7.3°C	11.5°C
Max. Temperature	9.9°C	20.1°C	24.6°C
Wind	Low	Low	Low
Rain(24 hrs to 9:00am)	1.0 mm	0 mm	0 mm

3.1 Flora Survey

3.1.1 Vegetation Community Mapping

A report “*The Vegetation of the Western Blue Mountains including the Capertee, Coxs, Jenolan and Gurnang Areas*” was prepared by the Department of Environment and Conservation in November 2005 (DEC 2006). The areas within the Newnes State Forest are covered by that report.

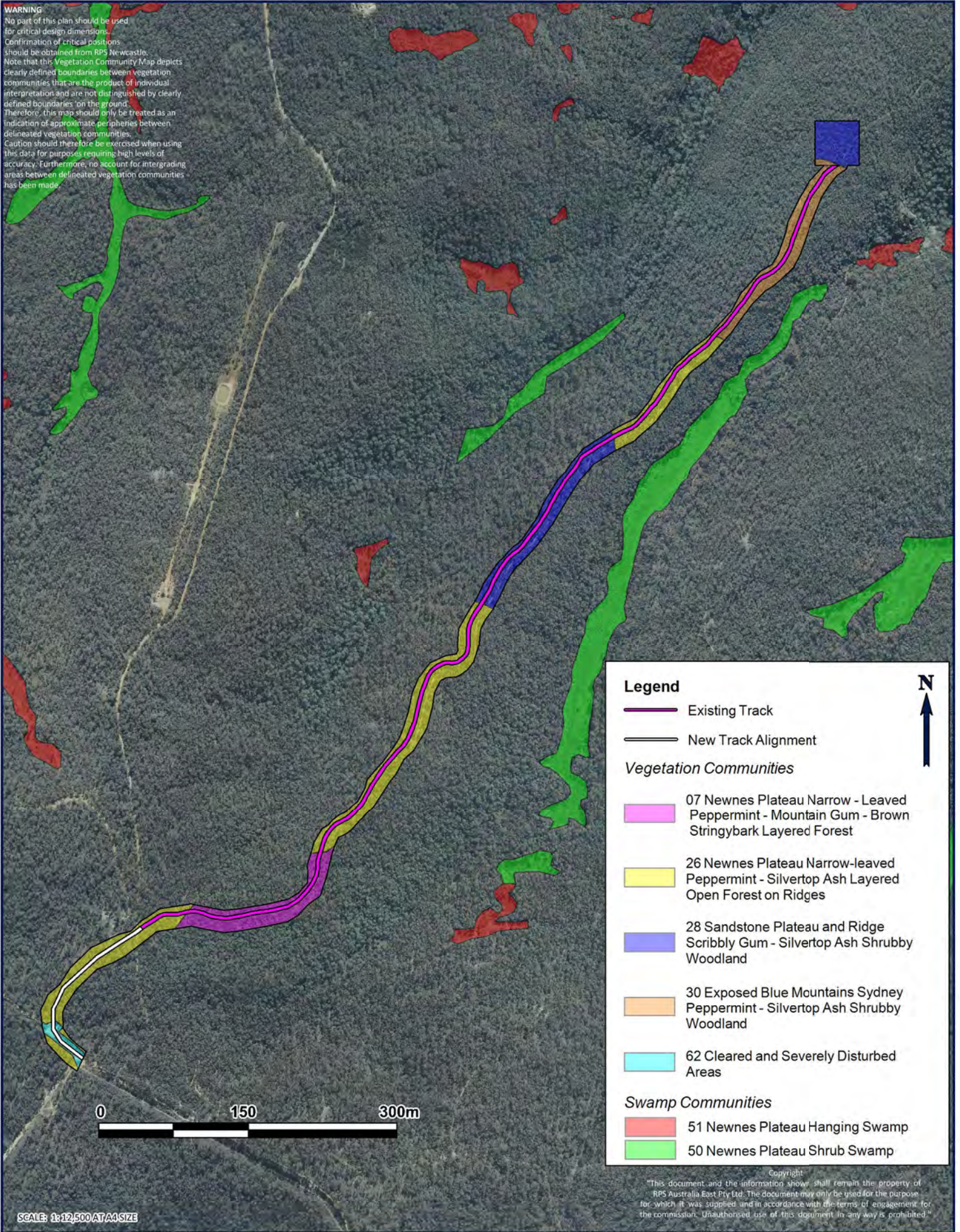
Previous vegetation mapping (DEC 2006) in conjunction with ground-truthing during surveys noted in Table 3-1 identified four vegetation communities within the Study Area.

The vegetation communities that occur within the Study Area include:

- MU 7 Newnes Plateau Narrow-leaved Peppermint – Mountain Gum – Brown Stringybark Layered Forest occurs along a section of the existing access track;
- MU 26 Newnes Plateau Narrow-leaved Peppermint – Silvertop Ash Layered Open Forest occupies several areas along the existing access track for Bore 8;
- MU 28 Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland that occupies the majority of the proposed location for the dewatering facility as well as an area along the existing access track; and
- MU 30 Exposed Blue Mountains Sydney Peppermint – Silvertop Ash Shrubby Woodland that occupies a small area of the proposed drill pad location as well as some of the adjacent access track.

The location of each vegetation community that occurs within the Study Area is included in Figure 3-1.

WARNING
 No part of this plan should be used for critical design dimensions. Confirmation of critical positions should be obtained from RPS Newcastle. Note that this Vegetation Community Map depicts clearly defined boundaries between vegetation communities that are the product of individual interpretation and are not distinguished by clearly defined boundaries on the ground. Therefore, this map should only be treated as an indication of approximate peripheries between delineated vegetation communities. Caution should therefore be exercised when using this data for purposes requiring high levels of accuracy. Furthermore, no account for intergrading areas between delineated vegetation communities has been made.



SCALE: 1:12,500 AT A4 SIZE

FIGURE 3-1: VEGETATION COMMUNITIES

LOCATION: SPRINGVALE
DEWATERING
BORE 8

DATUM: GDA 94
PROJECTION: MGA ZONE 56

DATE: 19/07/2012
PURPOSE: REPORT FIGURE

LAYOUT REF: J:\OBS\Centennial\All Jobs\110382 Springvale
Dewatering Bore 7 & 8\Drafting\
Workspaces\Eco
VERSION (PLAN BY): D A4 (AB-JS)

CLIENT: CENTENNIAL SPRINGVALE
JOB REF: 110382

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1. MU 7 – Newnes Plateau Narrow-leaved Peppermint – Mountain Gum – Brown Stringybark Layered Forest (refer to Plate 3-1)

- Description:** This vegetation community occurred throughout large areas of the Study Area and is located predominantly on the ridgetops and central parts of the plateau. This is a tall forest with a relatively open or sparse shrub layer and a variably dense to sparse ground layer.
- Canopy Layer:** 18m to 20m – 35% Percentage Foliage Cover (PFC). Dominant species include *Eucalyptus radiata* (Narrow-leaved Peppermint), *Eucalyptus blaxlandii* (Blaxland's Stringybark), *Eucalyptus sieberi* (Silver-top Ash), *E. dalrympleana* (Mountain Gum), with *Eucalyptus oreades* (Blue Mountains Ash) also occurring in parts of this community.
- Sub Canopy Layer:** 10m to 15m – 20% PFC. Dominant species included juvenile canopy species *Eucalyptus radiata* (Narrow-leaved Peppermint), *Eucalyptus blaxlandii* (Blaxland's Stringybark), *E. dalrympleana* (Mountain Gum) and occasional *Eucalyptus oreades* (Blue Mountains Ash).
- Shrub Layer:** 0.5m to 2m – 5 to 20% PFC. Dominant shrub species included *Daviesia latifolia*, *Monotoca scoparia* (Prickly Broom Heath), *Acacia terminalis* (Sunshine Wattle), *Lomatia silaifolia* (Crinkle Bush), *Polyscias sambucifolia* (Elderberry Panax), *Leucopogon lanceolatus* (Lance-leaf Beard-heath), *Boronia microphylla* (Small-leaved Boronia) and *Banksia cunninghamii*. Dominant small shrub species included; *Persoonia chamaepitys* (Mountain Geebung), *Phyllota squarrosa* (Dense Phyllota) and *Hibbertia obtusifolia* (Grey Guinea Flower).
- Ground Layer:** 0m to 1.2m – 35% PFC. Dominant species included *Poa sieberiana* var. *cyanophylla*, *Lomandra glauca* (Pale Mat-rush), *Dianella revoluta* (Spreading Flax Lily), *Arrhenechthites mixta* (Purple Fireweed), *Gonocarpus tetragynus* (Poverty Raspwort), *Joyceae pallida* (Silver-top Wallaby Grass), *Lomandra multiflora* (Many-flowered Mat-rush) and *Viola hederacea* (Ivy-leaved Violet). The climber, *Billardiera scandens* (Hairy Appleberry) was also recorded within this community.
- Classification:** This vegetation community is not considered to be commensurate with any Threatened Ecological Community listed under the *TSC Act 1995* or *EPBC Act 1999*.



Plate 3-1: MU 7 - Newnes Plateau Narrow-leaved Peppermint – Mountain Gum – Brown Stringybark Layered Forest

2. MU 26 – Newnes Plateau Narrow-leaved Peppermint – Silvertop Ash Layered Open Forest (refer to Plate 3-2)

Description: This vegetation community is generally open in structure with a sparse shrub layer. This vegetation community predominantly occurred in patches on the ridge-tops and side-slopes of the plateau and occupies small areas along the existing access track for bore 8. The dominant canopy species were *E. blaxlandii* (Blaxland's Stringybark), *E. radiata* (Narrow-leaved Peppermint), *E. sieberi* (Silvertop Ash) and *E. oreades* (Blue Mountains Ash) sometimes sparsely / dominantly present. This vegetation community often has a wide ecotone with Map Unit 7 - Newnes Plateau Narrow-leaved Peppermint – Mountain Gum – Brown Stringybark Layered Forest. As a result it is difficult to determine the boundaries at the interface of these individual communities. In addition, the ecotone of the community boundaries is enhanced by previous logging activities and subsequent regrowth.

Canopy Layer: 18m to 20m – 30 to 40% PFC. Dominant species included; *E. blaxlandii* (Blaxland's Stringybark), *E. radiata* (Narrow-leaved Peppermint), *E. sieberi* (Silvertop Ash), with *E. oreades* (Blue Mountains Ash) and to a lesser extent *E. dives* (Broad-leaved Peppermint) sometimes present.

Sub Canopy Layer: 8m to 15m – 30% PFC. Dominant species were mostly juvenile canopy species.

Shrub Layer: 1m to 4m – 2 to 5% PFC. Dominant shrub species included; *Monotoca scoparia* (Prickly Broom Heath), *Boronia microphylla* (Small-leaved Boronia), *Daviesia*

latifolia, *Hakea dactyloides* (Broad-leaved Hakea), *Lomatia silaifolia* (Crinkle Bush), *Isopogon anemonifolius* (Flat-leaved Drumsticks), *Petrophile sessilis* (Conesticks), *Acacia terminalis* (Sunshine Wattle) and *Banksia cunninghamii*.

Ground Layer: 0m to 1.2m – variable 20 to 60% PFC. Dominant species included; *Joyceae pallida* (Silvertop Wallaby Grass), *Patersonia sericea* (Wild Iris), *Pimelea linifolia* (Slender Rice Flower), *Dianella revoluta* (Spreading Flax Lily), *Amperea xiphoclada* (Broom Spurge), *Dampiera stricta* (Blue Dampiera), *Austrostipa pubescens* (Tall Speargrass), *Gonocarpus tetragynus* (Poverty Raspwort) and *Lomandra glauca* (Pale Mat-rush). The climber, *Billardiera scandens* (Hairy Appleberry) was also recorded within this community.

Classification: This vegetation community is not considered to be commensurate with any Threatened Ecological Community listed under the *TSC Act 1995* or *EPBC Act 1999*.



Plate 3-2: MU 26 – Newnes Plateau Narrow-leaved Peppermint – Silvertop Ash Layered Open Forest

3. MU 28 – Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland (refer to Plate 3-2)

- Description:** This vegetation community is in the footprint proposed for the construction of bore 8 along with a section of the access track. This community is generally found on the shallow soils and rocky sites across the upper Blue Mountains sandstones. It is typically an open forest or woodland community characterised by a diverse and quite dense midstratum.
- Canopy Layer:** To 20m – 25 to 30% PFC. Dominant species included; *Eucalyptus radiata* (Narrow-leaved peppermint), *Eucalyptus sieberi* (Silvertop Ash) and *Eucalyptus sclerophylla* (Scribbly Gum).
- Shrub Layer:** 0.5m to 6.0m – 5 to 15% PFC. Dominant shrub species included; *Lomandra glauca*, *Acacia terminalis* (Sunshine Wattle), *Banksia ericifolia* (Heath-leaved Banksia), *Hakea dactyloides* (Broad-leaved Hakea) and *Leptospermum trinervium* (Slender Tea-tree).
- Ground Layer:** 0m to 1.0m – 30 to 65% Percentage Foliage Cover (PFC). *Lomandra glauca*, *Entolasia stricta* (Wiry Panic) and *Goodenia bellidifolia* and *Patersonia sericea* (Silky Purple-Flag).
- Classification:** This vegetation community is not considered to be commensurate with any Threatened Ecological Community listed under the *TSC Act 1995* or *EPBC Act 1999*.



Plate 3-3 – MU 28 – Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland

5. MU 30 – Exposed Blue Mountains Sydney Peppermint – Silvertop Ash Shrubby Woodland (refer to Plate 3-5)

- Description:** This community is commonly found on the broad sandstone ridges of the Newnes Plateau and occupies a large area proposed for construction of bore 7 as well as access tracks for both bores 7 and 8.
- Canopy Layer:** 14m – 30m – 5 to 45% PFC. Dominant tree species included *Eucalyptus piperita* (Sydney Peppermint) and *Eucalyptus sieberi* (Silvertop Ash), whilst *Eucalyptus sclerophylla* (Scribbly Gum) and *Eucalyptus sparsifolia* (Narrow-leaved Stringybark) was also common.
- Shrub Layer:** 0.5m to 15m – 5 to 60% PFC. Dominant shrub species included *Acacia terminalis* (Sunshine Wattle), *Boronia microphylla* (Small-leaved Boronia), *Daviesia latifolia*, *Isopogon anemonifolius* (Flat-leaved Drumsticks), *Lomatia silaifolia* (Crinkle Bush), *Monotoca scoparia* (Prickly Broom-heath), *Leucopogon lanceolatus*, *Leucopogon muticus* (Blunt Beard-heath), *Monotoca scoparia* (Prickly Broom-heath) and *Persoonia linearis* (Narrow-leaved Geebung).
- Ground Layer:** 0m to 1.0m – 5 to 30% PFC. Dominant species include *Amperea xiphioclada* (Broom Spurge), *Caustis flexuosa* (Curly Wig), *Lomandra glauca* (Pale Mat-rush) and *Platysace lanceolata*.
- Classification:** This vegetation community is not considered to be commensurate with any Threatened Ecological Community listed under the *TSC Act 1995* or *EPBC Act 1999*.



Plate 3-4: MU 30 – Exposed Blue Mountains Sydney Peppermint – Silvertop Ash Shrubby Woodland

3.1.2 Significant Flora

The results of database searches (NPWS Atlas of NSW Wildlife and EPBC Protected Matters Search) indicated that 20 threatened flora species have been previously recorded within at least 10 km of the Study Area and/or have potential habitat within the Study Area. A list of these species is provided in Table 3-2. Where suitable habitat for potentially occurring significant flora species was found in the area, targeted surveys were conducted during field surveys.

Table 3-2: Threatened Flora found or potentially occurring within the Study Area

Scientific Name	Common Name	TSC Act Status	EPBC Act Status
<i>Acacia flocktoniae</i>	Flockton's Wattle	V	V
<i>Asterolasia elegans</i>	-	E	E
<i>Boronia deanei</i>	Deane's Boronia	V	V
<i>Caesia parviflora</i> var. <i>minor</i>	Small Pale Grass-lily	E	-
<i>Derwentia blakelyi</i>	-	V	-
<i>Eucalyptus pulverulenta</i>	Silver-leafed Gum	V	V
<i>Eucalyptus aggregata</i>	Black Gum	V	-
<i>Eucalyptus cannonii</i>	Capertee Stringybark	V	V
<i>Euphrasia arguta</i>	-	PD-CE	CE
<i>Galium australe</i>	Tangled Bedstraw	E	-
<i>Genoplesium superbum</i>	Superb Midge Orchid	E	-
<i>Haloragodendron lucasii</i>	-	E	E
<i>Lastreopsis hispida</i>	Bristly Shield Fern	E	-
<i>Persoonia acerosa</i>	Needle Geebung	V	V
<i>Persoonia hindii</i>	-	E	-
<i>Persoonia marginata</i>	Clandulla Geebung	V	V
<i>Prasophyllum</i> sp. <i>Wybong</i>	A leek-orchid	-	V
<i>Pultenaea glabra</i>	Smooth Bush-pea	V	V
<i>Thesium australe</i>	Austral Toadflax	V	V
<i>Wollemia nobilis</i>	Wollemi Pine	E	E

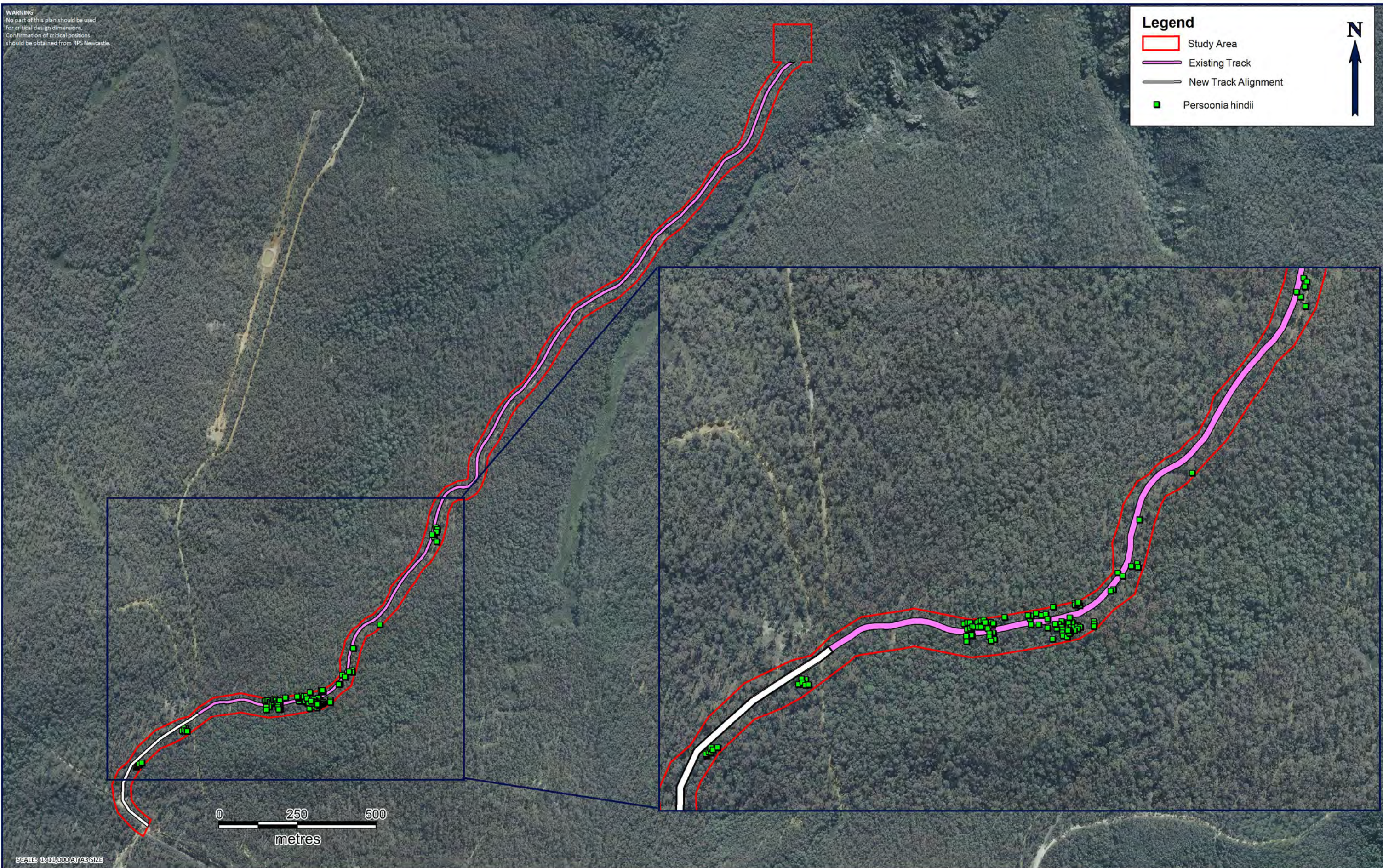
Notes: (PD) = Preliminary determination
 (V) = Vulnerable Species listing
 (E) = Endangered Species listing
 (CE) = Critically Endangered Species listing

Targeted surveys resulted in the identification of one threatened flora species, *Persoonia hindii*, which is listed as Endangered under the TSC Act 1995. *P. hindii* was identified in several patches along the existing access track for bore 8.

Persoonia hindii is an erect to spreading shrub 0.3 to 1m tall with upwardly-curving linear-oblong leaves usually concave on the upper surface. Numerous shoots arise from underground rhizomes with reddish young shoots often hairy. Mature leaves are glabrous. This species flowers from January to March with possible sporadic flowering in other months. Distribution is limited to the Newnes Plateau in the Upper Blue Mountains where it occurs in dry forest habitats.

WARNING
No part of this plan should be used
for critical design dimensions.
Confirmation of critical positions
should be obtained from RPS Newcastle.

- Legend**
- Study Area
 - Existing Track
 - New Track Alignment
 - Persoonia hindii



SCALE: 1:11,000 AT A3 SIZE

TITLE: FIGURE 3-2: THREATENED FLORA
LOCATIONS

LOCATION: SPRINGVALE DEWATERING
BORE 8

DATUM: GDA 94
PROJECTION: MGA ZONE 56

DATE: 19/07/2012
PURPOSE: REPORT FIGURE

LAYOUT REF: J:\JOBS\Centennial\All Jobs\110382 Springvale Dewatering Bores 7 & 8\Drafting\Workspaces\Eco
VERSION (PLAN BY): B A3 (AB-NW-JS)

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CLIENT: CENTENNIAL COAL
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A total of 93 *P. hindii* individuals were located within the Project Application Area, however 1352 *P. hindii* individuals were located adjacent to the development footprint (and will be retained), producing a total Study Area population of *P. hindii* of 1445 plants.

No other threatened flora species were recorded during the targeted surveys.

3.2 Habitat Survey

Habitats within the Study Area were assessed for their potential to support native flora and fauna species including threatened flora and fauna species for which records occur within the wider locality. The vegetation communities found within the Study Area can be broadly categorised as open forest/woodland habitat and swamp habitat.

Terrestrial Habitats

The open forest/woodland vegetation communities found in the Study Area contain an understory predominantly comprised of native grasses, herbs and ferns at varying densities. These provide suitable habitat for a number of terrestrial mammals including macropods and wombats. Large amounts of forest debris, partially resulting from forestry activities, also provide foraging opportunities for small marsupial mammals and rats.

Understorey structure is generally determined to have sufficient structural and species diversity to provide foraging and nesting opportunities for a range of woodland bird species and reptiles.

Vegetation within the surrounding swamp habitats contain high densities of proteaceous plants, that provide foraging opportunities for nectivorous mammals and birds, whilst the dense cover provides cover for more secretive understorey bird species. The damp ground cover is suited to a range of reptiles and amphibians that typically occur in higher altitude areas.

Arboreal Habitats

Canopy tree species and understorey proteaceous shrubs provide abundant foraging resources such as foliage, seeds, pollen, nectar and invertebrates for a range of faunal guilds, including arboreal mammals, bats and birds.

Despite a general paucity of large hollow-bearing trees as a result of selective logging activities within Newnes State Forest, they do occur in lower densities within the vicinity of the Study Area and across the Newnes Plateau. The hollow-bearing trees provide valuable nesting opportunities for arboreal mammals and birds including cockatoos and forest owls. No hollow bearing trees were identified within the Study Area during field surveys.

Open woodlands and forests across the Study Area, and the plateau in general, provide foraging opportunities for a range of microchiropteran bats that occur within the locality. Although the forests within and surrounding the Study Area only exhibit a low to moderate density of hollow-bearing trees, there are sufficient quantities to provide roosting and nesting habitat for a diversity of hollow-dwelling microchiropteran bat species. There is also abundant roosting and den habitat for cave dwelling species within rocky outcrops around the edges of the plateau and within the deeper gullies and associated

escarpments throughout the area. Older mine subsidence areas located in the wider locality may also provide habitat for these species.

The cleared areas (mostly tracks, fire-trails and powerline easements) occurring within the Study Area are considered to be insignificant in terms of providing habitat for native fauna species aside from providing foraging habitat along the ecotone between cleared and forested areas (such as for foraging by owls and microchiropteran bat species).

Corridors and Habitat Linkages

The Study Area is located within the Newnes State Forest and contains native vegetation which is unbroken over a large area apart from occasional access tracks and fire trails. The native vegetation is selectively logged intermittently under State Forest tenure with no areas being subjected to clear-felling.

As a result of the almost complete vegetative cover within and external to the Study Area, the habitat linkages throughout the Study Area and surrounding area are excellent. The mostly linear impacts of the Project are unlikely to substantially change this existing connectivity.

3.3 Fauna Survey

3.3.1 Desktop Fauna Literature Review

The results of database searches (NPWS Atlas of NSW Wildlife (Accessed 22/03/12), EPBC Protected Matters Search (Accessed 22/03/12) and recent RPS Threatened species records) indicated that 46 threatened fauna and two insect species have been previously recorded within at least 10km of the Study Area and/or have potential habitat within the Study Area. A list of these species is provided in **Error! Reference source not found.** Those species that have been identified within the Study Area during RPS surveys are highlighted in bold.

Table 3-3 Relevant Threatened Species and Threatened Ecological Communities Identified During a Review of Local Ecological Studies, records from the NSW Atlas of Wildlife and an EPBC Act Protected Matters Report

Scientific Name	Common Name	TSC Act	EPBC Act	Notes and Source
Fauna Species				
Birds				
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	NSW Atlas of Wildlife22
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E	Protected Matters Search21
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	Protected Matters Search21
<i>Lathamus discolor</i>	Swift Parrot	E	E	Protected Matters Search21
<i>Leipoa ocellata</i>	Malleefowl	E	V	Protected Matters Search21
<i>Rostratula australis</i>	Australian Painted Snipe	E	V	Protected Matters Search21
<i>Calyptorhynchus lathamii</i>	Glossy Black Cockatoo	V	-	Clarence Western SMP1, Springvale SMP area8, AP SMP14, 15, 17, 20, NSW Atlas of Wildlife22
<i>Callocephalon fimbriatum</i>	Gang Gang Cockatoo	V	-	Clarence Western SMP1, SV SMP5,6,7,8,9,10,11,12, AP SMP13,14,15,16,17,20, NSW Atlas of Wildlife22
<i>Stagonopleura guttata</i>	Diamond Firetail	V	-	NSW Atlas of Wildlife22
<i>Ninox strenua</i>	Powerful Owl	V	-	Clarence Western SMP1, Clarence Eastern SMP3, SV SMP area6,7,11,12, AP SMP14,15,16,17,20 , NSW Atlas of Wildlife22
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	Clarence Western SMP1, NSW Atlas of Wildlife22
<i>Tyto tenebricosa</i>	Sooty Owl	V	-	SV SMP11, NSW Atlas of Wildlife22
<i>Ninox connivens</i>	Barking Owl	V	-	AP SMP14, NSW Atlas of Wildlife22
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	AP SMP15,18, NSW Atlas of Wildlife22
<i>Chthonicola sagittata</i>	Speckled Warbler	V	-	Recorded within the AP SMP area in 200514, NSW Atlas of Wildlife22
<i>Climacteris picumnus</i>	Brown Treecreeper	V	-	Clarence Western SMP1, SV SMP5, Junction Swamp and Carne West Swamp5, SV SMP6,9,10,11, AP SMP 14,16,17,20, NSW Atlas of Wildlife22
<i>Melanodryas cucullata</i>	Hooded Robin	V	-	Clarence Western SMP1, SV SMP6, 8, AP SMP13, AP SMP14, NSW Atlas of Wildlife22

Scientific Name	Common Name	TSC Act	EPBC Act	Notes and Source
<i>Petroica phoenicea</i>	Flame Robin	V	-	Clarence Western SMP1, Clarence Eastern SMP3, SV SMP6,8,10,11,12. AP SMP13,14,15,16,18 ,NSW Atlas of Wildlife22
<i>Petroica boodang</i>	Scarlet Robin	V	-	Clarence Western SMP1,2, Clarence Eastern SMP3, SV SMP6,8,9,10,11,12. AP SMP13,14,15,16,17,19,20. AP 'New Area' 19, NSW Atlas of Wildlife22
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	Clarence Western SMP1,2, SV SMP10,11,12. AP SMP16,17,20, AP 'New Area'19, NSW Atlas of Wildlife22
<i>Melithreptus gularis gularis</i>	Black Chinned Honeyeater	V	-	SV SMP8, AP SMP13, NSW Atlas of Wildlife22
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler	V	-	SV SMP6, NSW Atlas of Wildlife22
Mammals				
<i>Dasyurus maculatus</i>	Spotted-tail Quoll	V	E	Protected Matters Search21, NSW Atlas of Wildlife22
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	-	NSW Atlas of Wildlife22
<i>Pseudomys fumeus</i>	Smokey Mouse	CE	E	Protected Matters Search21
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	-	V	Protected Matters Search21
<i>Isodon obesulus obesulus</i>	Southern Brown Bandicoot	E	E	Protected Matters Search21
<i>Phascolarctos cinereus</i>	Koala	V	V	AP SMP16, NSW Atlas of Wildlife22
<i>Cercartetus nanus</i>	Eastern Pygmy Possum	V	-	Clarence Western SMP1, SV SMP5, SV SMP6, 10, NSW Atlas of Wildlife22
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	Clarence Western SMP1, SV SMP5, SV SMP6,8, AP SMP14 , NSW Atlas of Wildlife22
<i>Petaurus australis</i>	Yellow-bellied Glider	V	-	Adjacent to Clarence Colliery23, NSW Atlas of Wildlife22
<i>Potorous tridactylus tridactylus</i>	Long Nosed Potoroo	V	V	Protected Matters Search21
<i>Pteropus poliocephalus</i>	Grey Headed Flying Fox	V	V	Protected Matters Search21
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	Clarence Western SMP1, Clarence Eastern SMP3, Clarence Colliery 'Area 800'4, SV SMP6, 9,10,11,12. AP SMP 13, 15, 17, NSW Atlas of Wildlife22
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	SV SMP9, 10, 11, AP SMP15, Protected Matters Search21 NSW Atlas of Wildlife22
<i>Scoteanax rueppellii</i>	Greater Broad Nosed Bat	V	-	SV SMP8, 11, AP SMP17, NSW Atlas of Wildlife22
<i>Chalinolobus picatus</i>	Little Pied Bat	V	-	Clarence Western SMP1
<i>Miniopterus schreibersii oceanensis</i>	Eastern-bent Wing Bat	V	-	Clarence Western SMP1,2,, Clarence East SMP4, SV SMP5,6,8,9,10,12. AP SMP13,15,17, NSW Atlas of Wildlife22

Scientific Name	Common Name	TSC Act	EPBC Act	Notes and Source
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat	V	-	NSW Atlas of Wildlife22
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	-	NSW Atlas of Wildlife22
Reptiles				
<i>Eulamprus leuraensis</i>	Blue Mountains Water Skink	V	-	Clarence Western SMP1, Protected Matters Search21 NSW Atlas of Wildlife22
<i>Hoplocephalus bungaroides</i>	Broad Headed Snake	E	V	Protected Matters Search21 NSW Atlas of Wildlife22
<i>Varanus rosenbergi</i>	Rosenberg's Monitor	V	-	NSW Atlas of Wildlife22
Amphibians				
<i>Litoria booroolongensis</i>	Booroolong Frog	E	E	Protected Matters Search21
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	V	V	Protected Matters Search21
<i>Mixophyes balbus</i>	Stuttering Frog	E	V	SV SMP5, Protected Matters Search21, NSW Atlas of Wildlife22
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	AP SMP18. Protected Matters Search21
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V	-	NSW Atlas of Wildlife22
Invertebrates				
<i>Paralucia spinifera</i>	Bathurst Copperwing Butterfly	E	V	Protected Matters Search21 NSW Atlas of Wildlife22
<i>Petalura gigantea</i>	Giant Dragonfly	E	-	NSW Atlas of Wildlife22

Key:

AP= Angus Place

SV= Springvale

SMP= Subsidence Management Plan

V= vulnerable species

E= endangered species

CE= critically endangered species

Under consideration= species currently being considered for listing as vulnerable under the EPBC Act 1999.

Footnotes

¹ Denny, M. (2008) Clarence Colliery- Western SMP Area Fauna Monitoring 2008, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

² Denny, M. (2010) 2010 Fauna monitoring within the Western Subsidence Management Plan Application Area at Clarence Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

³ Denny, M. (2010) 2010 Fauna monitoring within the Eastern Subsidence Management Plan Application Area at Clarence Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

- ⁴ Denny, M. (2010) Area 800 (Eastern Portion) Autumn 2010 Fauna Monitoring Survey, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.
- ⁵ Denny, M. (2004) 2004 Fauna monitoring within the subsidence management plan area at Springvale Colliery, unpublished report to Centennial Coal, Mount King Ecological Surveys, Oberon.
- ⁶ Denny, M. (2005) 2005 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Mount King Ecological Surveys, Oberon.
- ⁷ Denny, M. (2006) 2006 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Mount King Ecological Surveys, Oberon.
- ⁸ Denny, M. (2007) 2007 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Mount King Ecological Surveys, Oberon.
- ⁹ Denny, M. (2008) 2008 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.
- ¹⁰ Denny, M. (2010) 2009 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.
- ¹¹ Denny, M. (2011) 2010 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.
- ¹² Denny, M. (2011) 2011 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, Autumn 2011 Sample, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.
- ¹³ Denny, M. (2004) 2004 Fauna monitoring within the subsidence management plan area at Angus Place Colliery, unpublished report to Centennial Coal, Mt King Ecological Surveys, Oberon.
- ¹⁴ Denny, M. (2006) 2005 Fauna monitoring within the subsidence management plan area at Angus Place Colliery, unpublished report to Centennial Coal, Mt King Ecological Surveys, Oberon.
- ¹⁵ Denny, M. (2007) 2006 Fauna monitoring within the subsidence management plan area at Angus Place Colliery, unpublished report to Centennial Coal, Mt King Ecological Surveys, Oberon.
- ¹⁶ Denny, M. (2008) 2007 Fauna monitoring within the subsidence management plan area at Angus Place Colliery, unpublished report to Centennial Coal, Mt King Ecological Surveys, Oberon.
- ¹⁷ Denny, M. (2009) Fauna monitoring during 2008 within the subsidence management plan application area at Angus Place Colliery, unpublished report to Centennial Coal, Mt King Ecological Surveys, Oberon.
- ¹⁸ Denny, M. (2010) 2009 Fauna monitoring within the subsidence management plan application area at Angus Place Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.
- ¹⁹ Denny, M. (2011) Angus Place Colliery New Area Fauna Monitoring Surveys for Autumn 2011, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.
- ²⁰ Denny, M. (2011) Fauna monitoring within the subsidence management plan application area at Angus Place Colliery, Autumn 2011 Sample, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.
- ²¹ SEWPAC (2012) EPBC Protected Matters Report, accessed 22nd March 2012
- ²² Office of Environment and Heritage (2012) NSW Atlas of Wildlife, accessed 22nd March 2012
- ²³ International Environmental Consultants (2000) *Clarence Colliery Lease Extension - Environmental Impact Statement*, International Environmental Consultants.

3.3.2 Terrestrial Mammal Species

No terrestrial mammal species were recorded within the Project Application Area for the bore sites or access tracks, however several species of macropod have been observed by RPS within the locality including the Red-necked Wallaby (*Macropus rufogriseus*), Eastern Grey Kangaroo (*Macropus giganteus*) and Swamp Wallaby (*Wallabia bicolor*). Additionally, signs of habitation by the Common Wombat (*Vombatus ursinus*) have been frequently encountered in the vicinity of the Study Area by RPS staff.

No threatened terrestrial mammal species have been recorded by RPS in the locality, however the habitat of the Spotted-tail Quoll (*Dasyurus maculatus*) within the Study Area is of sufficient quality and isolation to support this species. Although plateau forests characterise much of the surface areas of the Study Area and offer sufficient isolation from human habitation, the occurrence of ongoing timber harvesting, wildlife disease and reduction in old growth attributes may limit the potential for this species to occur over much of the Study Area.

3.3.3 Arboreal Mammal Species

Canopy tree species and understorey proteaceous shrubs provide abundant foraging resources such as foliage, seeds pollen, nectar and invertebrates for possums, gliders and bats. Arboreal mammal species common to the locality that have been detected during previous RPS surveys (see RPS 2010) include the Greater Glider (*Petauroides volans*), Common Ringtail Possum (*Pseudocheirus peregrinus*) and Common Brushtail Possum (*Trichosurus vulpecula*). Although not observed during surveys, there is suitable habitat within the Study Area for smaller gliders such as the Sugar Glider (*Petaurus breviceps*) and the TSC-listed Squirrel Glider (*P. norfolcensis*). During field surveys on the Newnes Plateau for monitoring of the potential impact of longwall mining on fauna communities, Martin Denny has recorded Squirrel Glider on a number of occasions, a species listed as Vulnerable under the *TSC Act 1995*.

One threatened species, Eastern Pygmy Possum (*Cercartetus nanus*), is listed as Vulnerable under the *TSC Act 1995* and was detected on the Newnes Plateau approximately 1.5km northwest of the Study Area during recent RPS surveys (2012). During surveys by Martin Denny breeding Eastern Pygmy Possum has been previously recorded. Similar vegetation communities and high connectivity between the Study Area and those known to be utilised by this species suggests it is likely that the Eastern Pygmy Possum would inhabit the Study Area on either a temporary or permanent basis.

Records for the Yellow-bellied Glider (*Petaurus australis*) are sparse on the Newnes Plateau and this highly vocal species has not been observed during any RPS spotlighting and/or call playback surveys. This species has also not been recorded on the Newnes Plateau during extensive field surveys for monitoring of longwall mining impact by Martin Denny.

No other arboreal mammals have been recorded during previous RPS spotlighting surveys.

3.3.4 Bats

Several species of microchiropteran bats have been positively identified in the locality by RPS through either Anabat echolocation call recordings or physical capture in harp traps. These species include the threatened Large Eared Pied Bat (*Chalinolobus dwyeri*; RPS 2010), Eastern False Pipistrelle

(*Falsistrellus tasmaniensis*; RPS 2010) and Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*; RPS 2011). These species are listed as Vulnerable under the *TSC Act 1995* whilst the Large Eared Pied Bat is also listed as Vulnerable under the *EPBC Act 1999*. Surveys by Martin Denny have also regularly recorded the Eastern Bent Wing Bat (*Miniopterus schreibersii oceanensis*).

3.3.5 Avifauna Survey

Bird species recorded within the Study Area included many common woodland and forest species, including several threatened species. Two species listed as Vulnerable under the *TSC Act 1995*, Scarlet Robin (*Petroica boodang*) and Masked Owl (*Tyto novaehollandiae*) have been identified within the boundaries of the Study Area during both opportunistic bird surveys and previous RPS surveys (2012) in the locality. During field surveys monitoring potential longwall mining impacts, Martin Denny has recorded a number of threatened bird species within 5km of the Study Area including Gang Gang Cockatoo (*Callocephalon fimbriatum*), Scarlet Robin, Flame Robin (*Petroica phoenicea*), Hooded Robin (*Melanodryas cucullata*) and the Varied Sittella (*Daphoenositta chrysoptera*). Additionally, the Varied Sittella has been identified in the locality (the Newnes Plateau) by RPS previously (2010) whilst the Flame Robin and Gang-gang Cockatoo (both listed as Vulnerable under the *TSC Act 1995*) have been identified within 1km of the Study Area.

No *Allocasuarina* tree species favoured by Glossy Black-Cockatoos were present within vegetation communities within the Study Area.

One threatened forest owl species, the Masked Owl (*Tyto novaehollandiae*), was detected within the Study Area during related ecological surveys for Centennial by RPS in 2012. Two other species, the Powerful Owl (*Ninox strenua*) and Sooty Owl (*Tyto tenebricosa*) have been recorded by RPS within the locality through either visual identification or call playback methods in late 2011 and early 2012 respectively. Field surveys by Martin Denny on the Newnes Plateau have recorded these owl species along with the Barking Owl (*Ninox connivens*), with all four owl species being listed as Vulnerable under the *TSC Act 1995*. It is likely that the Study Area represents a portion of the local foraging range for these species given the presence or likely presence of small terrestrial and arboreal mammals. However, the quality of the Study Area as habitat for the Powerful Owl (a species that almost exclusively utilises arboreal prey) is potentially reduced due to the low abundance of arboreal prey compared to less disturbed and more productive forests.

3.3.6 Herpetofauna Survey

Opportunistic diurnal observations of reptiles and amphibians were conducted during field assessments of the Study Area. Species identified include the Common Brown Snake (*Pseudonaja textilis*) and Common Death Adder (*Acanthopis antarcticus*).

Targeted and opportunistic searches have been undertaken in the locality during previous RPS surveys for the Blue Mountains Water Skink (*Eulamprus leuraensis*), which is listed as Endangered under both the *TSC Act 1995* and the *EPBC Act 1999*. However, only a number of common skink species were recorded, including two species related to the Blue Mountains Water Skink being Yellow-bellied Water Skink (*E. heatwolei*) and Eastern Water Skink (*E. quoyii*).

During nocturnal surveys around the Study Area in 2012, RPS ecologists recorded common amphibian species including the Common Eastern Froglet (*Crinia signifera*), Eastern Banjo Frog (*Lymnodynastes dumerilli*) and Striped Marsh Frog (*Lymnodynastes peroni*). Previous surveys by Martin Denny in the locality have recorded the threatened Giant Burrowing Frog (*Heleioporus australiacus*) and the Stuttering Frog (*Mixophyes balbus*). Even though suitable streamside breeding habitat does not exist within the Study Area, the use of the Study Area by non-breeding Giant Burrowing Frogs cannot be entirely discounted (Penman et al. 2006).

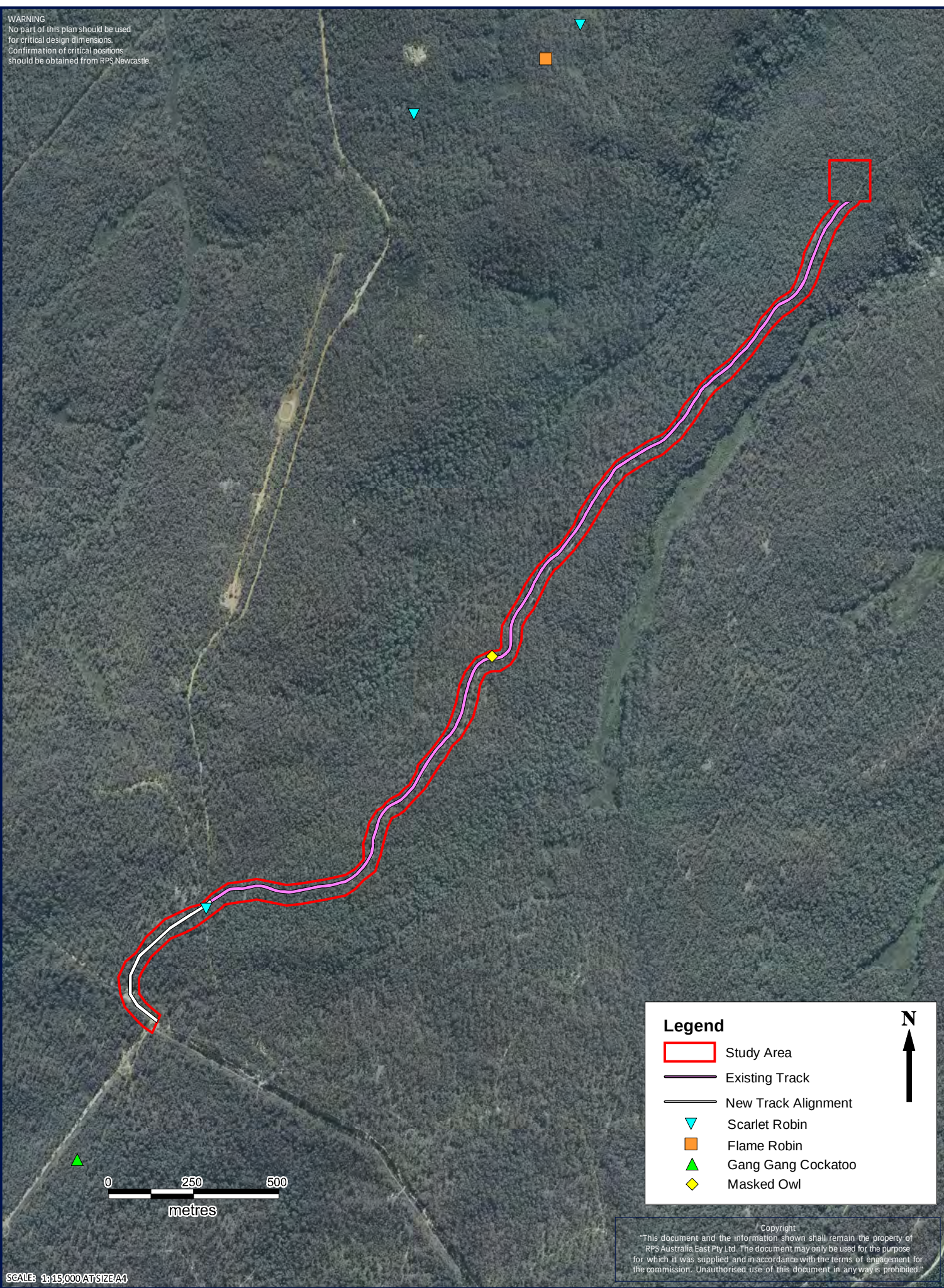
3.3.7 Insect Searches

Opportunistic searches were made for the Giant Dragonfly and the Bathurst Copper Butterfly. However, the Study Area does not occur in proximity to aquatic habitats where it may be possible for the dragonfly to live out its life cycle. The favoured larval feed plant species of the Bathurst Copper Butterfly, being *Bursaria spinosa*, was not present in the Study Area or observed elsewhere in the locality. Neither of these two species was observed during the surveys undertaken.

3.3.8 Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, skeletal remains, diggings, tracks etc.) did note signs that suggested the presence of mammal species. The scats and tunnels of Common Wombat and scats of various sized macropods were noted at numerous locations throughout the Study Area.

WARNING
No part of this plan should be used
for critical design dimensions.
Confirmation of critical positions
should be obtained from RPS Newcastle.



Legend

- Study Area
- Existing Track
- New Track Alignment
- ▼ Scarlet Robin
- Flame Robin
- ▲ Gang Gang Cockatoo
- ◆ Masked Owl



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TITLE: FIGURE 3-3: THREATENED
FAUNA LOCATIONS

LOCATION: SPRINGVALE
DEWATERING BORE 8

DATUM: GDA 94
PROJECTION: MGA ZONE 56

DATE: 19/07/2012
PURPOSE: REPORT FIGURE

LAYOUT REF: J:\JOBS\Centennial\All Jobs\108478
Angus Place - Was 1090341\Drafting\
Workspaces
VERSION (PLAN BY): JS (A A4)

CLIENT: CENTENNIAL
JOB REF: 110382

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RPS

4.0 Threatened Species and Communities Assessment

4.1 Identification of Subject Species and Communities

Threatened flora and fauna species (listed under the *TSC Act 1995* and/or the *EPBC Act 1999*) that have been recorded and/or have suitable habitat within at least a 10km radius of the Study Area have been considered within this assessment. TECs known from the broader area have also been addressed. Each species / community is considered for its potential to occur in the Study Area and the likely level of impact as a result of the Project. This assessment deals with each species / community separately and identifies the ecological parameters of significance associated with the Project.

Those species / communities that have been identified as having a 'greater than low' chance of being impacted upon within the Study Area or that have been recorded within the Study Area during field investigations are subject to 7-part tests of significance and have been recorded in Appendix 1.

The *Assessment of Likelihood of Occurrence of Threatened Species and Communities and Assessment of Potential Impacts* deals with the following topics of consideration in tabulated form (refer to Table 4-1):

'Species / Community' – Lists each threatened species / TECs known from the locality. The status of each threatened species under the *TSC Act 1995* and the Commonwealth *EPBC Act 1999* are also provided.

'Habitat Description' – Provides a brief account of the species / community and the preferred habitat attributes required for their existence / survival.

'Likelihood of Occurrence' – Assesses the likelihood of each species / community to occur along or within the locality of the Study Area in terms of the aforementioned habitat description and taking into account local habitat preferences, results of current field investigations, data gained from various sources (such as Atlas of NSW Wildlife etc) and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

'Potential for Impact' – Assesses the likely level / significance of impacts to each species / community that would result from the Project, taking into account both short and long-term impacts. This assessment is largely based on the chance of occurrence of each species / community in Study Area with due recognition to other parameters such as home range, habitat utilisation, connectivity etc. It also considers the scope of the Project, including the likely extent of disturbance, duration of construction works etc.

Table 4-1: Assessment of Likelihood of Occurrence of Threatened Species and Communities and Assessment of Potential Impacts

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Plants			
<i>Acacia flocktoniae</i> Flockton Wattle (V, V*)	Found only in the Southern Blue Mountains (at Mt Victoria, Megalong Valley and Yerranderie). Grows in dry sclerophyll forest on sandstone.	This species was not detected during targeted field surveys and has not been recorded within a 10 km radius of the Study Area. However, it has been recorded within Lithgow LGA. While the habitat in the Study Area has the potential to support this species, the Study Area is outside its known distribution. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring in the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Asterolasia elegans</i> (E, E*)	This species is found in the northern hills of Sydney, and only currently known from 7 populations in the Central Coast botanic subdivision.	This species was not detected during targeted field surveys and has not been recorded within a 10 km radius of the Study Area. While the habitat in the Study Area has the potential to support this species, the Study Area is outside its known distribution. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring in the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Boronia deanei</i> Deane's Boronia (V, V*)	Occurs in wet heath appearing to prefer the margins of open forest where it adjoins swamps and streams. It is known to occur in the Blue Mountains in the upper Kangaroo River near Carrington falls, the Endrick River near Nerriga and on the Nalbaugh Plateau.	This species was not detected during targeted field surveys. Although this species has been recorded within a 10 km radius of the Study Area, there is no damp riparian habitat within the vicinity of the Study Area. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring in the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Caesia parviflora</i> var. <i>minor</i> Small Pale Grass-lily (E)	A little known species, Found in damp places in open forest on sandstone south from Corindi. The species has the potential to occur within the Newnes Pateau Hanging Swamp communities and adjoining habitats.	This species was not detected during targeted field surveys. Although this species has been recorded within a 10 km radius of the Study Area, there are no damp places in open forest on sandstone habitat within the Study Area. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring in the Study Area, it is considered unlikely to be impacted on by the Project.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
<i>Derwentia blakelyi</i> (V)	Occurring in small numbers, often in moister areas of Eucalypt forest, this species flowers in summer and is known from fewer than 20 locations. It is known to occur in the Western Blue Mountains near Clarence, near Mt Horrible, Nullo Mountain and in the Coricudgy Range.	This species was not detected during targeted field surveys. Although this species has been recorded within a 10 km radius of the Study Area, there are moister areas of Eucalypt forest within the the Study Area. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring in the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Eucalyptus pulverulenta</i> Silver-leafed Gum (V, V*)	Grows in shallow soils as an understorey plant in open forest, typically dominated by Brittle Gum (<i>Eucalyptus mannifera</i>), Red Stringybark (<i>E. macrorhyncha</i>), Broad-leafed Peppermint (<i>E. dives</i>), Silvertop Ash (<i>E. sieberi</i>) and Apple Box (<i>E. bridgesiana</i>). Often occurs on granite substrates.	This species was not detected during targeted field surveys and has not been recorded within a 10 km radius of the Study Area. While the habitat within the Study Area has the potential to support this species, the Study Area is outside its known distribution. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Eucalyptus aggregata</i> Black Gum (V)	In NSW it occurs in the South Eastern Highlands Bioregion and on the western fringe of the Sydney Basin Bioregion. It grows in the lowest parts of the landscape on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers.	The frost hollows or flats preferred by this species was not recorded within the Study Area. This species is unlikely to occur within the Study Area.	Due to this species being unlikely to occur, it is considered unlikely to be impacted upon by this Project.
<i>Eucalyptus cannonii</i> Capertee Stringybark (V, V*)	Regionally restricted north of Wallerawang to Capertee, found growing in drier conditions on rocky outcrops, often with <i>Eucalyptus macrorhyncha</i> , often in vegetation map unit MU 35.	This species was not detected during targeted field surveys but has been recorded within a 10 km radius of the Study Area. The Study Area occurs outside of the main distribution of this species, therefore it is considered unlikely to occur within the Study Area.	Due to this species being unlikely to occur, it is considered unlikely to be impacted upon by this Project.
<i>Euphrasia arguta</i> (Preliminary determination to be CE, CE*)	The current known populations are located in the Nundle State Forest in eucalypt forest with a mixed grass and shrub understorey. This area is located at the junction of the New England Tableland, NSW North Coast, and Nandewar. Ecological information from historical herbarium records is scarce. Three collections noted the following habitat, 'in the open forest country around Bathurst in subhumid places', 'on the grassy country near Bathurst', 'in meadows near rivers'.	This species was not detected during targeted field surveys and has not been recorded within a 10 km radius of the Study Area. While the habitat within the Study Area has the potential to support this species, the Study Area is outside its known distribution. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring in the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Galium australe</i> Tangled Bedstraw (E)	<i>Galium australe</i> has been recorded from a range of habitats in NSW including a valley floor, alluvial soil beside a creek, heathland in a rocky gully, and the top of an escarpment above a creek. It has a patchy distribution, with low numbers of plants recorded at most locations and with the total number currently estimated to be less than 200.	This species was not detected during field surveys. This species has been recorded within 10 km of the Study Area (Wildlife Atlas, 2012 however this record is potentially incorrect. Refer to section 6). It has potential to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Genoplesium superbum</i> Superb Midge Orchid (E)	A terrestrial orchid restricted to the southern tablelands of NSW where it has been recorded from two locations near Nerriga, approximately 20 km apart. The species occurs predominantly in wet heathland on shallow soils above a sandstone cap but has also been found in open woodland interspersed with heath. Flowers – Sep to Mar.	This species was not detected during targeted field surveys which were conducted during the flowering season. Although the species has been recorded within 10 km of the Study Area, no wet heath habitat occurs within the Study Area. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Haloragodendron lucasii</i> (E, E*)	Confined to a very narrow distribution on the north shore of Sydney. Is known to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. Is associated with high moisture and high soil-phosphorus soils.	This species was not detected during targeted field surveys. Also this species has not been recorded within a 10 km radius of the Study Area. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
<i>Lastreopsis hispida</i> Bristly Shield Fern (E)	Is rare in NSW with the only recent confirmed records from Mt Wilson in the Blue Mountains. It grows in moist humus-rich soils in wet forest and rainforest gullies. At Mt Wilson, associated species include <i>Ceratopetalum apetalum</i> , <i>Elaeocarpus holopetalus</i> , <i>Fieldia australis</i> , <i>Cyathea australis</i> , <i>Blechnum nudum</i> , <i>B. patersonii</i> and <i>Leptopteris fraseri</i> .	This species was not detected during targeted field surveys. Although this species has been recorded within 10 km of the Study Area, suitable habitat of moist forest or rainforest does not occur within the Study Area. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of within the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Persoonia acerosa</i> Needle Geebung (V, V*)	An erect shrub between 1 and 2 m with characteristic needle-like leaves that are deeply channelled above. It has been recorded in dry-sclerophyll forest, low scrubby-woodland and heath growing on low-fertility soils. This species prefers open habitat with lower competition and increased light, hence its presence in roadside habitats. It occurs on the Central Coast and in the Blue Mountains largely in the Katoomba, Wentworth Falls and Springwood areas, but once occurred as far north as Mount Tomah where it is now considered to be absent.	This species has been recorded within 10 km of the Study Area (Wildlife Atlas, 2012). Some areas of habitat within the vicinity of the Study Area are suitable for this species. This species has potential to occur within the Study Area but was not observed.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Persoonia hindii</i> (E)	Distribution is limited to the Newnes plateau in the Upper Blue Mountains where it occurs in dry forest and woodlands on sandy soils. Flowers January to March.	The species was recorded within the Project Application Area.	This species was detected within the Project Application Area along the ridge line habitat. Therefore, this species is likely to be affected by the Project and is further assessed in Sections 6 and 7 .
<i>Persoonia marginata</i> (V, V*)	Found on the Central Tablelands and South Coast of NSW, including in the Ben Bullen State Forest. Its preferred habitat is dry sclerophyll forest	This species has been recorded within 10 km of the Study Area (Wildlife Atlas, 2012). Some areas of habitat within the vicinity of the Study Area are suitable for this species. This species has potential to occur within the Study Area but was not observed.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Prasophyllum</i> sp. <i>Wybong</i> (CE*)	It is known from seven populations in open eucalypt woodland and grassland in New South Wales. The species' area of occupancy is estimated to be 1.5 km ² with an estimated population size based on surveys in 2006 of 460 mature individuals. This species occurs within the Sydney Basin, New England Tablelands, Brigalow Belt South and NSW South Western Slopes IBRA Bioregions and the Border Rivers–Gwydir, Namoi, Hunter–Central Rivers and Central West Natural Resource Management Regions.	This species was not detected during targeted field surveys. Also, this species has not been previously detected within 10 km of the Study Area. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Pultenaea glabra</i> Smooth Bush-pea (V, V*)	Restricted to the higher Blue Mountains and has been recorded from the Katoomba-Hazelbrook and Mount Victoria areas, with unconfirmed sightings in the Mount Wilson and Mount Irvine areas. All known populations occur within the Blue Mountains Local Government Area. Grows in swamp margins, hill slopes, gullies and creek banks and occurs within dry sclerophyll forest and tall damp heath on sandstone. Flowers September to November, fruit matures October to December.	This species was not detected during targeted field surveys. Also, this species has not been previously detected within 10 km of the Study Area. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Thesium australe</i> Austral Toadflax (V, V*)	Grows in grassland or woodland, often in damp sites in association with Kangaroo Grass (<i>Themeda australis</i>).	This species was not detected during targeted field surveys and the preferred damp grassy habitats do not occur within the Study Area. Additionally this species has not been recorded within a 10 km radius of the Study Area. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
<i>Wollemia nobilis</i> Wollemi Pine (E, E*)	Little is known about the ecology of this recently-discovered species; ecological research is currently ongoing. Occurs in warm temperate rainforest and rain forest margins in remote sandstone canyons.	This species was not detected during targeted field surveys and the preferred remote rainforest canyon habitats do not occur within the Study Area. Additionally this species has not been recorded within a 10 km radius of the Study Area. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
Herpetofauna			
<i>Eulamprus leuraensis</i> Blue Mountains Water Skink (E, E*)	Occurs at high elevations between 560 m and 1060 m from the Newnes Plateau to just south of Hazelbrook. It is restricted to an isolated and naturally fragmented habitat of sedge and shrub swamps that have boggy soils and appear to be permanently wet. The vegetation in these swamps typically takes the form of a sedgeland interspersed with shrubs, but may occur as a dense shrub thicket. This species has been recorded from 8 locations on the Newnes Plateau, all within Shrub Swamp communities (DEC 2001a). Elsewhere within its distribution (eg in the Eastern Blue Mountains) the species is known from Hanging Swamps, although mostly from larger swamps with standing water (DEC 2001a).	Although Hanging Swamps occur within the Study Area, these swamps are relatively small without standing water. While a small possibility occurs to these swamps being used by this species, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Heleioporus australiacus</i> Giant Burrowing Frog (V, V*)	The current distribution of <i>H. australiacus</i> is south-eastern NSW to Vic. Locally it occurs north to Jervis Bay (Daly 1996), and is mostly restricted to sandy creek banks, often in association with crayfish burrows in this area (Robinson 1996). The northern population has a marked preference for sandstone ridge-top habitat and broader upland valleys. In these locations the frog is associated with small headwater creek lines and along slow flowing to intermittent creek-lines. <i>H. australiacus</i> is grey to dark chocolate brown or black above with a white belly, a few yellow spots along the flanks. During the summer, males call like an owl hoot, from burrows within creek banks. Females lay eggs in a foamy nest in the burrow, and the developing tadpoles are washed from the burrows into the creeks during heavy rain.	This species was not detected during targeted field surveys, however it has been recorded twice within the vicinity of the Study Area during monitoring surveys in recent years, including a site near Angus Place Longwall 900W at Kangaroo Creek (Denny 2011). Additional scattered records occur throughout the Blue Mountains National Park. Woodland habitat within the Study Area may provide suitable substrates for the burrowing habits of this species; however, the stream characteristics (running water) are not suited to the breeding requirements of this species. However its occurrence within the Study Area cannot be entirely discounted at non breeding times, thus this species could potentially occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7.
<i>Hoplocephalus bungaroides</i> Broad-headed Snake (E, V*)	Largely confined to Triassic sandstones, including the Hawkesbury, Narellan and Shoalhaven formations, within the coast and ranges. Nocturnal, sheltering by day in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. In summer it is known to become semi-arboreal in its search for prey including geckos and skinks, and will shelter in hollows in large trees within 200 m of rocky escarpments. The Broad-headed Snake is regarded as potentially dangerous, although it has not been attributed to any human fatalities. Destruction of habitat, particularly the removal of sandstone slabs has lead to a decline in numbers.	This species was not detected during targeted field surveys. The preferred exfoliating sandstone habitat of this species does not occur within the Project Application Area and no records occur within the vicinity of the Project Application Area. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Varanus rosenbergi</i> Rosenberg's Monitor (V)	The Rosenberg's Monitor is a species found throughout southeastern Australia, but locally is restricted to the Sydney Basin and southern escarpment forests where terrestrial termite mounds occur (used for breeding).	This species was not detected during field surveys. While suitable habitat does occur, records do not occur for the Newnes Plateau. Therefore it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
<i>Litoria booroolongensis</i> Booroolong Frog (E, E*)	Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins. Shelter under rocks or amongst vegetation near the ground on the stream edge. Sometimes bask in the sun on exposed rocks near flowing water during summer. Breeding occurs in spring and early summer and tadpoles metamorphose in late summer to early autumn. Eggs are laid in submerged rock crevices and tadpoles grow in slow-flowing connected or isolated pools.	This species was not detected during targeted field surveys whilst stream-side habitats favoured by this species are not present within the Study Area. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Litoria littlejohni</i> Little John's Tree Frog (V, V*)	Occurs on the plateaus and eastern plains of the Great Dividing Range from scattered locations between the Watagan Mountains NSW south to Buchan in Victoria. It is pale brown dark speckles. Occurs along permanent rocky creeks with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops. Despite its very large distribution there are very few records of the <i>Litoria littlejohni</i> . It is known to call through most of the year with a peak in summer. Clusters of up to 60 eggs are attached to submerged twigs, stems or branches, often near the banks of still pools or clear, slowly flowing streams. Metamorphosis occurs mostly in the months of December and January.	This species was not detected during targeted field surveys. Although this species is known to occur in open woodland habitat there are no records for this species from the Newnes Plateau. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Mixophyes balbus</i> Stuttering Frog (E, V*)	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Breeds in streams during summer after heavy rain, outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Eggs are laid on rock shelves or shallow riffles in small, flowing streams.	This species was not detected during targeted field surveys. This species has been recorded within 10 km of the Study Area and the non breeding habitat for this species is poorly understood. Subsequently the habitat within the Study Area may occur as non breeding habitat. Thus there is a very small likelihood that this species could potentially occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
<i>Pseudophryne australis</i> Red Crowned Toadlet (V)	Restricted to the Sydney Basin with strongholds around the Hawkesbury River. It occurs in soaks and other damp areas in forest.	This species has not been detected during targeted field surveys of the Newnes Plateau by Martin Denny, however a single record of the species occurs on the NSW Atlas of Wildlife. It is considered unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
Insects			
<i>Paralucia spinifera</i> Bathurst Copper Butterfly (E, V*)	A small sized butterfly with a wingspan of 20–30 mm, occurring on the Central Tablelands of NSW in an area approximately bounded by Oberon, Hartley and Bathurst. This species is known at 35 locations, all within the Greater Lithgow, Bathurst Regional and Oberon local government areas. It favours sites with a southwest to north-west aspect, usually where direct sunlight reaches the habitat, and with extremes of cold such as regular winter snowfalls or heavy frosts.	This species was not observed within the Study Area and known populations of this species are from a small area to the south and east of Bathurst. The preferred larval feed plant of this butterfly, <i>Bursaria spinosa</i> (Native Blackthorn), does not occur in the vicinity of the Study Area. Therefore, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Petalura gigantea</i> Giant Dragonfly (E)	<i>Petalura gigantea</i> can be found along the east coast of NSW, from the Victorian border to northern NSW. There are only a handful of known locations in NSW. They occur in permanent swamps and bogs with some water and open vegetation.	Although this species has been recorded within 10km of the Study Area, this species was not observed during targeted field surveys. A lack of habitat for this species within the Study Area has determined it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
Avifauna			
<i>Anthochaera phrygia</i> Regent Honeyeater (CE, E*)	Occurs in temperate woodlands and open forest, including forest edges. Seasonal movements appear to be dictated by the flowering of various species of <i>Eucalyptus</i> sp. that are characteristic of the dry forests and woodlands of South-Eastern Australia. The Regent Honeyeater prefers to forage on large-flowered <i>Eucalypts</i> . They also forage on mistletoe and <i>Banksia</i> flowers, and arthropods. Nesting occurs mainly between November and January, but breeding has been recorded in all months between July and February.	This species was not detected during targeted field surveys. Well known as occurring in the Capertee area, individuals are recorded in more easterly habitat, particularly in areas characterised by winter flowering <i>Eucalyptus</i> ssp. when westerly habitats are experiencing extended dry periods. As such this species may occur in Newnes Plateau forests on an intermittent basis. Therefore, this species could potentially occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Botaurus poiciloptilus</i> Australasian bittern (V, E*)	This species occurs across southern Australia including Tasmania and the south-west of Western Australia. Within New South Wales it occupies discrete wetland systems of the coast and floodplain wetlands of the more inland areas of its range.	This species was not detected during targeted field surveys, and has not been recorded within a 10 km radius of the Study Area. A lack of available wetland habitat on the Newnes Plateau has determined it unlikely for the species to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Callocephalon fimbriatum</i> Gang-Gang Cockatoo (V)	Found in the summer months in tall mountain forests and woodlands, 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 in some districts.	The species has been recorded within 10km of the Study Area multiple times during fieldwork by RPS in 2010, 2011 and 2012. Suitable habitat exists within the Study Area and this species is therefore likely to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Calyptorhynchus lathamii</i> Glossy Black-Cockatoo (V)	Occurs in forests and woodlands where it forages predominantly on <i>Allocasuarina</i> cones, particularly those of <i>A. littoralis</i> , <i>A. torulosa</i> and at time <i>A. distyla</i> . Requires large Eucalypt tree hollows for nesting. Local records occur on the Newnes Plateau.	This species was not detected during targeted field surveys. Also no preferred habitat of <i>Allocasuarina</i> species (<i>A. littoralis</i> , <i>A. torulosa</i> and/or <i>A. distyla</i>), were observed within the Study Area and there are limited hollow-bearing trees to represent breeding opportunities for this species. Therefore the Project Application Area is unlikely to represent suitable habitat for this species.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
<i>Chthonicola sagittata</i> Speckled Warbler (V)	Occupies Eucalypt and Cypress woodlands in drier areas and on the western/eastern slopes of the Great Dividing Range. More commonly found on the western slopes, mainly due to habitat. Requires a grassy understorey, a sparse shrub layer and an open canopy. Most foraging takes place on ground around tussocks, around bushes and trees. Appears unable to persist in districts where no forested fragments larger than 100ha remain.	This species was not detected during targeted field surveys. A dry open woodland bird favouring habitats with dense understorey areas, this species is only likely to sparsely occur in western areas of the Newnes Plateau. Therefore the Project Application Area is unlikely to represent suitable habitat for this species.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Climacteris picumnus victoriae</i> Brown Treecreeper (V)	Frequents drier forests and woodlands, particularly open woodland lacking a dense understorey. Also found in grasslands in proximity to wooded areas where there are sufficient logs, stumps and dead trees nearby. Feeds on invertebrate larvae and small insects, particularly ants. Utilises hollows for roosting/nesting. Appears not to persist in remnants less than 200 ha. A number of records exist on the Newnes Plateau to the northwest of the Study Area (Atlas of NSW Wildlife Data 2009).	This species was not detected during targeted field surveys. However, there are a large number of records of the species within the locality and potential habitat therefore occurs within the Project Application Area. Therefore, this species has potential to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Daphoenositta chrysoptera</i> Varied Sittella (V)	A canopy species occurring across a wide variety of wooded habitats including wet and dry forests / woodlands and in some areas, tall heathlands. Forages for a range of invertebrate prey and differs from Treecreeper species in foraging in both up and down orientations on trunks and branches. Occurs widely across mainland Australia in suitable habitat.	The species was recorded within 10 km of the Study Area by RPS during fieldwork in 2010. Suitable habitat also exists within the Study Area and this species is therefore likely to occur within the Study Area	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Heiraaetus morphonoides</i> Little Eagle (V)	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion (DECCW 2010).	This species was not recorded within the Study Area during fieldwork. This species is known to occur in open eucalypt forest and has been previously recorded from the Newnes Plateau. The species has the potential to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Leipoa ocellata</i> Malleefowl (E, V*)	Although historically widespread, Malleefowl are now currently restricted to mallee areas of inland semi-arid scrub. They feed on ants and seeds of <i>Acacia</i> and <i>Senna</i> sp. during the summer and autumn, whilst varying their diet to include flower blossoms and other invertebrates during the cooler, damper months.	This species was not recorded within the Study Area during fieldwork and has not been observed within a 10 km radius of the Study Area. Additionally, given a lack of suitable habitat for this species within the Study Area or on the Newnes Plateau in general, the Project Application Area is unlikely to represent suitable habitat for this species.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Glossopsitta pusilla</i> Little Lorikeet (V)	The Little Lorikeet is a species found throughout the Eucalypt forests and woodlands of Eastern Australia, however can potentially occur further inland. They are considered to be nomadic, following flowering Eucalypts. In recent times this species has declined as a result of habitat modification and the removal of nesting hollow-bearing trees.	This species was not recorded within the Study Area during fieldwork. This species is known to occur in open eucalypt forest, woodland or open woodland. Due to the contiguous nature of suitable habitat on the Newnes Plateau, the species is likely to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Stagonopleura guttata</i> Diamond Firetail (V)	The Diamond Firetail is found throughout central and eastern NSW, where it occupies drier forests, woodland and mallee. Due to the extensive clearance of suitable habitat for agriculture, this species has declined in recent years.	This species was not recorded within the Study Area during fieldwork. Due to the species preference for drier habitats, it is unlikely to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
<i>Lathamnus discolor</i> Swift Parrot (E, E*)	The Swift Parrot is an austral migrant, widely dispersing from breeding grounds in Tasmania to areas of mainland Australia including South Australia, Victoria, the ACT, eastern New South Wales and into South-east Queensland. They feed on nectar and lerp (carbohydrates produced by sap sucking insects on leaves) associated with eucalypts, and their dispersal and distribution is highly variable between years depending on food availability (TSSC 2012).	This species was not recorded within the Study Area during fieldwork and has not been observed within a 10 km radius of the Study Area. Additionally, the species predominantly prefers coastal woodlands and forests of New South Wales, preferring eucalypt species typically not found on the Newnes Plateau. Therefore the Project Application Area is unlikely to represent suitable habitat for this species	As this species has a low likelihood of occurring within the Study Area, it is considered unlikely to be impacted on by the Project.
<i>Melanodryas cucullata</i> Hooded Robin (V)	Primarily known from Eucalypt forest, woodland and scrub, although has been known to use cleared paddocks with regrowth or stumps in close proximity to wooded areas. Favours areas with sparse shrub cover and fallen timber. Appears unable to persist in remnants less than 100-200 ha.	This species was not recorded within the Study Area during fieldwork. This species is generally a more western species, occurring in open woodlands with diverse understorey attributes. The habitat within the Study Area is not considered suitable for this species, despite the occurrence of records further to the east in the wider locality. Therefore the Project Application Area is unlikely to represent suitable habitat for this species.	There is limited opportunity for species to occur within the Study Area, and as such the Project is unlikely to affect a significant area of potential habitat.
<i>Melithreptus gularis gularis</i> Black-chinned Honeyeater (V)	In NSW this species occurs in eastern Australia, along the inland slopes of the Great Dividing Range, extending to the coast between Sydney and Newcastle, NSW. Occupies dry Eucalypt woodland within an annual rainfall range between 400-700 mm, particularly within associations containing Ironbark and Box species (Garnett and Crowley 2000). It is estimated that the Black-chinned Honeyeater spends 60% of its time searching foliage for such food as insects, nectar and lerp.	This species was not recorded within the Study Area during fieldwork. A woodland / open forest bird, this species may sparsely occur in Newnes Plateau forests in areas where habitat structural diversity is high. The habitat within the Study Area is not considered to offer sufficient structural diversity to suit this species. Therefore the Project Application Area is unlikely to represent suitable habitat for this species.	There is limited opportunity for species to occur within the Study Area, therefore the Project is unlikely to affect a significant area of potential habitat.
<i>Ninox connivens</i> Barking Owl (V)	Occurs mainly in dry sclerophyll woodland. Nests in large Eucalypt hollows, and roosts in hollows or thick vegetation. Can be found roosting in dense <i>Acacia</i> sp. and <i>Casuarina</i> sp. or the dense clumps of Eucalypt trees. More commonly found west of the divide and on the slopes. Favours tree lined watercourses, with hollow-bearing tress. Hunts a range of prey species including birds and both terrestrial and arboreal mammals.	This species was not recorded within the Study Area during fieldwork. This species is generally a more western species, individuals are occasionally recorded in more easterly habitat, particularly those areas characterised by large expanses of wooded habitat. As such this species may sparsely occur in Newnes Plateau forests on an intermittent basis. Therefore the Project Application Area is unlikely to represent suitable habitat for this species.	Due to the low likelihood of occurrence it is unlikely that this species will be adversely affected by the Project.
<i>Ninox strenua</i> Powerful Owl (V)	Occurs in coastal and adjacent ranges of eastern Australia in sclerophyll forests and woodlands where suitable prey species occur (being predominantly arboreal mammals such gliders and flying foxes, but also preys on birds). Requires large and specific hollow characteristics for nesting. Pairs appear to mate for life and occupy exclusive territories in the order of 1000 ha in size.	The species was recorded within 10 km the Study Area by RPS during fieldwork in 2011. It is likely that the Study Area occurs within the foraging range and perhaps the breeding territory of locally occurring Powerful Owl individuals. Therefore, this species could potentially occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Petroica boodang</i> Scarlet Robin (V)	A woodland and open forest species, which forages in the mid to lower storeys on a variety of invertebrate prey. Generally an altitudinal migrant the Scarlet Robin spends the warmer months in the ranges and winters in lowland dry open forests and woodland. Occurs patchily in eastern Australia across wooded habitats.	This species was recorded within the Study Area.	As this species was recorded within the Study Area and thereby has potential to be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Petroica phoenicea</i> Flame Robin (V)	A woodland and open forest species, which prefers the wooded edges of open areas and forages in the lower storey on a variety of invertebrate prey. Generally an altitudinal migrant the Flame Robin, like a number of other robin species spends the warmer months in the ranges and winters in more lowland open country and woodlands. Usually encountered in high altitudinal areas including above snowline habitat in some regions.	This species was recorded within 1km of the Study Area by RPS ecologists during fieldwork in 2012. It is likely that the Study Area represents breeding and foraging habitat for this species. Due to the contiguous nature of suitable habitat on the Newnes Plateau, the species is likely to occur within the Study Area.	As this species was recorded within close vicinity of the Study Area and thereby has potential to be affected by the Project, this species is further assessed in Sections 6 and 7 .

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
<i>Pomatostomus temporalis temporalis</i> Grey-crowned Babbler (eastern subspecies) (V)	Occupies open forests and woodlands, Acacia shrubland and adjoining farmland. Also Box-Gum Woodlands on the divide slopes and Box-Cypress Pine and open Box Woodlands on the plains. They feed on terrestrial invertebrates and insects on lower trunks and branches. Generally they prefer wooded areas with an intact ground cover, although in such areas as the Hunter Valley they occur in sparsely vegetated areas such as properties and golf courses. Appears unable to persist in cleared and highly fragmented habitats. Nest comprise of a dome shape stick nest which is often only a couple of metres from the ground in shrubs or Eucalypt saplings.	This species was not recorded within the Study Area during fieldwork. A dry open woodland bird favouring habitats with open understorey areas, this species may sparsely occur in western areas of the Newnes Plateau. However there are no habitat opportunities for this species within the Study Area and this species was not observed during avian surveys. Therefore the Project Application Area is unlikely to represent suitable habitat for this species.	Due to the low likelihood of occurrence it is unlikely that this species will be adversely affected by the Project.
<i>Rostratula australis</i> 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. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.	This species was not detected during targeted field surveys, and has not been recorded within a 10 km radius of the Study Area. A lack of available wetland habitat on the Newnes Plateau has determined it unlikely for the species to occur within the Study Area.	Due to the low likelihood of occurrence it is unlikely that this species will be adversely affected by the Project.
<i>Tyto novaehollandiae</i> Masked Owl (V)	Found in a range of habitats, more commonly found in dry eucalypt forests and woodlands. A forest owl which often hunts on forest edges and also roadsides. Requires large Eucalypt hollows for nesting and these hollows are also preferred for roosting sites. Breeding has also been recorded in caves.	The species was recorded within the Study Area during RPS fieldwork in February 2012.	As this species was recorded within the Study Area and thereby has potential to be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Tyto tenebricosa</i> Sooty Owl (V)	Occurs in tall, moist eucalypt forests and rainforests of the escarpment, eastern tablelands and coastal areas of NSW. They are found in areas of steep and/or undulating topography however they are strongly associated with sheltered gullies with a typically tall, rainforest understory.	This species was recorded within 10 km of the Study Area by RPS during fieldwork in 2012. It is therefore likely that the Study Area occurs within foraging and potentially breeding territory of locally occurring Sooty Owl individuals. Therefore, this species could potentially occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
Mammals			
<i>Phascolarctos cinereus</i> Koala (V, V*)	Occurs throughout Eastern Australia, including Queensland, New South Wales, Victoria and South Australia in more productive forests and woodlands. Populations are impacted upon by collisions, dog attacks, fires, habitat destruction and disease. There is a north-south range retraction with significant declines occurring in New South Wales and Queensland, however southern populations are more stable.	This species has been recorded on one occasion on the Newnes Plateau. Due to the occurrence of Eucalyptus viminalis within the Study Area (a potential feed tree), the species could potentially occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Vespadelus troughtoni</i> Eastern Cave Bat (V)	This species is a cave dwelling bat found throughout Eastern Australia. It occurs within sclerophyll forests foraging for insects.	This species has not been recorded during extensive surveys on the Newnes Plateau by Martin Denny. It is considered unlikely that it occurs within the Study Area.	Due to the low likelihood of occurrence it is unlikely that this species will be adversely affected by the Project.
<i>Cercartetus nanus</i> Eastern Pygmy Possum (V)	Occurs from rainforest through sclerophyll forest to tree heath. Favoured food being banksias, myrtaceous shrubs and trees and insects. Nesting sites are generally in drier habitats (Strahan 2004). Records exist from the Watagan Mountains (Atlas of NSW Wildlife data).	This species was recorded within 10 km of the Study Area by RPS during fieldwork in 2010 and 2012. Coupled with the existence of suitable habitat within the Study Area, this species is likely to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat (V, V*)	Found in well-timbered areas containing gullies. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy.	This species was recorded within 10 km of the Study Area by RPS during fieldwork in 2010. Suitable habitat also occurs and this species is therefore likely to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Dasyurus maculatus</i> Spotted-tailed Quoll (V, E*)	Found in a variety of forested habitats from sclerophyll forests, rainforests and coastal woodlands. This species creates a den in fallen hollow logs or among rocky outcrops. Generally does not occur in otherwise suitable habitats that are in close proximity to urban development. A number of records occur across the Newnes Plateau; however no records exist for within 10km of the Study Area (Atlas of NSW Wildlife data). It is an opportunistic hunter of a variety of prey.	This species was not recorded within the Study Area during fieldwork, whilst no records exist for this species within 10 km of the Study Area. However this species has been recorded elsewhere on the Newnes Plateau. Given that suitable habitat occurs within the Study Area, it has the potential to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle (V)	This species is found in a variety of forest types such as open forests, woodlands and wetter sclerophyll forests (usually with trees >20m). This species roosts in tree hollows. Hunts beetles, moths, weevils and other flying insects below or just above the canopy.	This species was recorded within 10 km of the Study Area by RPS during fieldwork in 2010. Suitable habitat also occurs and this species is therefore likely to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Chalinolobus pictatus</i> Little Pied Bat (V)	This species is an inland species found throughout Central New South Wales and Queensland occurring in drier habitat types.	While a record of this species occurs from nearby Clarence Colliery, due to the preferred inland habitat for the species, it is considered unlikely to occur within the Study Area.	Due to the low likelihood of occurrence it is unlikely that this species will be adversely affected by the Project.
<i>Isodon obesulus obesulus</i> Southern Brown Bandicoot (E, E*)	The Southern Brown Bandicoot has a patchy distribution. It is found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River, southern coastal Victoria and the Grampian Ranges, south-eastern South Australia, south-west Western Australia and the northern tip of Queensland. They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils.	This species was not recorded within the Study Area during fieldwork. Also this species is not known to occur in the area. Therefore it is considered unlikely that the species occurs within the Study Area.	Due to the low likelihood of occurrence it is unlikely that this species will be adversely affected by the Project.
<i>Miniopterus schreibersii</i> subsp. <i>oceanensis</i> Eastern Bentwing Bat (V)	Prefers to forage in well-vegetated areas, such as within wet and dry sclerophyll forests and rainforests and also dense coastal Banksia scrub. Requires caves or similar structures for roosting habitat. Occasionally roost in tree hollows. Largely confined to more coastal areas.	This species was not recorded within the Study Area during fieldwork, although potential foraging and roosting habitat are widespread within the locality. Also due to its mobility, it has the potential to occur within the Study Area on at least an intermittent basis.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Petaurus australis</i> Yellow-bellied Glider (V)	Usually associated with tall, mature wet Eucalypt forest usually with high rainfall and nutrient rich soils. Also known from tall dry open forest and mature woodland. In the north of NSW they favour mixed coastal forests to dry escarpment forests and in the south they prefer moist coastal gullies to creek flats and tall montane forests. The diverse diet of this species is primarily made up of Eucalypt nectar, sap, honey dew, manna and invertebrates found under decorticating bark and pollen. Tree hollows for nest sites are essential, as are suitable food trees in close proximity.	This species was not recorded within the Study Area during fieldwork. There are few records for this species in the wider locality. Chance of occurrence is low, but cannot be entirely discounted. Therefore, this species could potentially occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
<i>Petaurus norfolcensis</i> Squirrel Glider (V)	Occurs in eucalypt forests and woodlands where it feeds on sap exudates and blossoms. In these areas tree hollows are utilised for nesting sites. Also requires winter foraging resources when the availability of normal food resources may be limited, such as winter-flowering shrub and small tree species.	Although suitable habitat for this species occurs within the Study Area, it or its close relative the Sugar Glider were not observed during nocturnal spotlighting surveys or arboreal trapping. This species has been recorded by Martin Denny during biodiversity monitoring surveys on the Newnes Plateau. However, as suitable habitat occurs within the Study Area, it has the potential to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby (E, V*)	Occurs in forests and woodlands along the Great Divide and on the western slopes in escarpment country with suitable caves and rocky overhangs for shelter. Records exist from the Watagan Mountains where it is associated with the above habitats (DEC 2005; RPS pers. obs.).	This species was not recorded within the Study Area during fieldwork. Given that the Study Area does not include suitable habitat for <i>P. penicillata</i> it is considered unlikely that the species occurs within the Study Area.	Due to the low likelihood of occurrence it is unlikely that this species will be adversely affected by the Project.
<i>Potorous tridactylus</i> Long-nosed Potoroo (V, V*)	Prefers cool rainforest, wet sclerophyll forest and heathland. Essentially, requires dense understorey with occasional open areas. These open areas most likely consist of sedges, ferns, heath or grass-trees. Sleeps by day in a nest on the ground, and digs for succulent roots, tubers, fungi and subterranean insects. Some diggings seemingly attributable to this species may belong to <i>Isoodon macrourus</i> (Northern Brown Bandicoot). Generally east of the divide, hides by day in dense vegetation, sometimes feeds during winter during daylight hours during overcast or low light conditions.	This species was not recorded within the Study Area during fieldwork. Also this species is not known to occur within 10 km of the Study Area. Therefore, it is considered unlikely that the species occurs within the Study Area.	Due to the low likelihood of occurrence it is unlikely that this species will be adversely affected by the Project.
<i>Pseudomys fumeus</i> Smoky Mouse (CE, E*)	In NSW there are 3 records from Kosciuszko National Park and 2 records adjacent to the park in Bondo and Ingbyra State Forests; the remainder are centred around Mt Poole, Nullica State Forest and the adjoining S. E. Forests National Park. They appear to prefer heath habitat on ridge tops and slopes in sclerophyll forest, heathland and open-forest from the coast (in Victoria) to sub-alpine regions of up to 1800 m, but sometimes occurs in ferny gullies.	This species was not recorded within the Study Area during fieldwork. Also this species is not known to occur in the region. Therefore it is considered unlikely that the species occurs within the Study Area.	Due to the low likelihood of occurrence it is unlikely that this species will be adversely affected by the Project.
<i>Pseudomys novaehollandiae</i> New Holland Mouse (V*)	Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey and vegetated sand dunes. It is a social animal, living predominantly in burrows shared with other individuals. Their home range is from 0.44 ha to 1.4 ha. The species peaks in abundance during early to mid stages of vegetation succession typically induced by fire.	This species was not recorded within the Study Area during fieldwork. Also this species is not known to occur in the region. Therefore it is considered unlikely that the species occurs within the Study Area.	Due to the low likelihood of occurrence it is unlikely that this species will be adversely affected by the Project.
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox (V, V*)	Forages over a large area for nectar / fruits etc. Occurs across subtropical and temperate forest, sclerophyll forest and woodlands, heaths, swamps, urban gardens and cultivated crops. Frequently observed to forage in flowering Eucalypts. Seasonally roosts in communal base camps situated within wet sclerophyll forests or rainforest. These camps are usually located within 20km's of their food source. Frequently observed to forage in flowering Eucalypts.	This species was not recorded within the Study Area during fieldwork. Also this species is not known to occur in the region. Therefore it is considered unlikely that the species occurs within the Study Area.	Due to the low likelihood of occurrence it is unlikely that this species will be adversely affected by the Project.
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat (V)	Range of habitats from rainforest to arid shrubland, roosts in tree-hollows, sometimes roosts in mammal burrows when no hollows available. Seasonal movements are unknown, may migrate to southern Australia in summer. Feeds by foraging for insects over the canopy, but flies low in arid shrubland.	This species was recorded within 10 km of the Study Area by RPS during fieldwork in 2010 and 2011. Suitable habitat also occurs and this species is therefore it is likely to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat (V)	Forages in moister gullies and wet sclerophyll forests as well as in lightly wooded areas and open spaces/ecotones, most commonly found in tall wet forest. Open woodland and habitat and dry open forest suits the direct flight of this species as it searches for beetles and other larvae. This species roosts in tree hollows, although has been recorded in buildings.	This species was not recorded within the Study Area during fieldwork, although potential foraging and roosting habitat are widespread within the locality. Also due to its mobility, it has the potential to occur within the Study Area on at least an intermittent basis.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in Sections 6 and 7 .
Threatened Ecological Communities			
Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion (E) Note: this community also corresponds to; Temperate Highland Peat Swamps on Sandstone (E*)	This community occurs in the headwaters of water courses draining the Newnes Plateau. It occurs where low slope gradients and vegetation impede water flow in headwater valleys and is dominated by sedges and shrubs that favour poorly drained sites. The community occurs at higher elevations than Blue Mountains sedge swamps and in the Bell and Clarence area the transition between these communities occurs at approximately 850-950 m. Newnes Plateau shrub swamp has a greater dominance of shrubs when compared to Blue Mountains Sedge Swamps.	Vegetation mapping (DEC 2006) has identified this community within close proximity (approximately >110m to Carne West Swamp and 210 m to Sunnyside East Swamp) to the access road to Bore 8. MU 50 corresponds to the Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion (TSC listed TEC) as well as the Temperate Highland Peat Swamps on Sandstone (EPBC listed TEC). This Community is considered unlikely to occur within the Study Area.	Due to the low likelihood of occurrence within the Study Area, it is considered that provided the sediment and erosion controls developed for the Project (GSSE, 2012) are adhered to, this vegetation community is unlikely to be impacted on by the Project. However, this community occurs within close proximity to the Study Area and thereby has potential to be indirectly affected by the Project. Therefore, this community is further assessed in Sections 6 .
Newnes Plateau Hanging Swamp in the Sydney Basin Bioregion (E) Note: this community also corresponds to; Temperate Highland Peat Swamps on Sandstone (E*)	This vegetation community occurs in gully heads and ridge-top sites where groundwater seepage travelling through permeable rock layers is directed laterally by impermeable layers. These form wet peaty soils in which a range of swamp heath flora species grow.	Vegetation mapping (DEC 2006) and ground-truthing by RPS ecologists have identified patches of this community within close proximity to the north of the Study Area (~300m) and to the south (~150m). This community corresponds to MU 51 within DEC (2006) (TSC listed TEC) along with the Temperate Highland Peat Swamps on Sandstone community (EPBC listed TEC). This community is considered unlikely to occur within the Study Area.	Due to the low likelihood of occurrence within the Study Area, it is considered that provided the sediment and erosion controls developed for the Project (GSSE, 2012) are adhered to, this vegetation community is unlikely to be impacted on by the Project. However, this community occurs within close proximity to the Study Area and thereby has potential to be indirectly affected by the Project. Therefore, this community is further assessed in Sections 6 .

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions (E) Note: this community also corresponds to; Temperate Highland Peat Swamps on Sandstone (E*)	This community is associated with accumulated peaty or organic-mineral sediments on poorly drained flats in the headwaters of streams. It occurs on undulating tablelands and plateaus, above 400-500 m elevation, generally in catchments with basic volcanic or fine-grained sedimentary substrates or, occasionally, granite. It comprises a dense, open or sparse layer of shrubs with soft-leaved sedges, grasses and forbs. It is the only type of wetland that may contain more than trace amounts of <i>Sphagnum</i> spp., the hummock peat-forming mosses. This community is known to occur within the Lithgow LGA.	The vegetation composition used to determine the presence of this ecological community was not found to occur within the Study Area. Therefore, it is considered unlikely to occur within the Study Area.	Due to the low likelihood of occurrence within the Study Area, it is considered that this vegetation community is unlikely to be impacted on by the Project.
White Box – Yellow Box – Blakeley’s Red Gum Grassy Woodland and derived native Grassland (E, CE*)	This community is dominated by <i>Eucalyptus albens</i>, <i>E. melliodora</i> and <i>E. blakelyi</i> and has an open grassy understorey with sparsely scattered shrubs. It can also take the form of grassland wherever the trees have been removed.	The vegetation composition used to determine the presence of this ecological community was not found to occur within the Study Area. Therefore, it is considered unlikely to occur within the Study Area.	Due to the low likelihood of occurrence within the Study Area, it is considered that this vegetation community is unlikely to be impacted on by the Project.

Notes: (V) = Vulnerable Species listed under the *Threatened Species Conservation Act 1995*.
(E) = Endangered Species listed under the *Threatened Species Conservation Act 1995*.
(CE) = Critically Endangered Species listed under the *Threatened Species Conservation Act 1995*.
(V*) = Vulnerable Species listed under the *Commonwealth EPBC Act 1999*.
(E*) = Endangered Species/Community listed under the *Commonwealth EPBC Act 1999*.
(CE*) = Critically Endangered Species/Community listed under the *Commonwealth EPBC Act 1999*.

4.2 Key Threatening Processes

Key Threatening Processes (KTPs) are listed in Schedule 3 of the *TSC Act 1995*. Six KTPs have the potential to affect the Study Area as a consequence of the Project, being:

- Anthropogenic climate change
- Clearing of Native Vegetation
- Infection of native plants by *Phytophthora cinnamomi*
- Loss of hollow-bearing trees
- Removal of dead wood and dead trees
- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands

“Anthropogenic Caused Climate Change”

The Project is likely to contribute to the Key Threatening Process “Anthropogenic Caused Climate Change”, which has the potential to impact upon the Sooty Owl (DEC 2000), a species that may utilise the Study Area for foraging and/ or roosting. The Project contributes to this KTP as a result of clearing a small amount (4 ha) of native vegetation. The extent to which the Project could contribute to this process is considered unlikely to be significant.

“Clearing of Native Vegetation”

The Project will require the removal of a relatively small area (4 ha) of native vegetation, which has the potential to impact upon the Eastern Pygmy Possum, Large Eared Pied Bat, Spotted Tail Quoll, Yellow Bellied Gilder, Squirrel Glider, Koala, Yellow Bellied Sheathtail Bat, Greater Broad Nosed Bat, Powerful Owl, Masked Owl, Sooty Owl and Regent Honeyeater (DEC 2001b). This clearing will incrementally contribute to the Key Threatening Process “Clearing of Native Vegetation”. The extent to which the Project could contribute to this process is considered unlikely to be significant, particularly given 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and therefore will only be a temporary impact. .

“Infection of native plants by *Phytophthora cinnamomi*”

The Project has the potential to result in the importation of this pathogen, which has the potential to impact upon populations of *Persoonia hindii* (DEC 2003). It is considered that with the correct hygiene protocols in place, the Project is unlikely to significantly contribute to this process.

“Loss of hollow-bearing trees”

Despite there being no hollow bearing trees identified within the Study Area, obscure hollows unidentifiable by ecologists on the ground may exist and subsequently contribute to this Key Threatening Process. Potentially this may impact upon the Gang Gang Cockatoo, Brown Treecreeper, Powerful Owl, Masked Owl, Sooty Owl, Eastern Pygmy Possum, Spotted Tail Quoll, Eastern False Pipistrelle, Yellow Bellied Glider, Squirrel Glider, Yellow Bellied Sheathtail Bat and Greater Broad Nosed Bat (DEC 2007). Hollow-bearing trees provide habitat for many diurnal and nocturnal birds and arboreal mammals. Being under State Forest tenure, the area has had a long history of clearing of trees before they reach a level of

maturity where hollows develop. There is a subsequent lack of hollow-bearing trees in the locality, and given the extensive amounts of habitat surrounding the Project Application Area that include hollow-bearing trees, it is considered unlikely that the removal of a small number of hollows would significantly impact those hollow dependent species that are considered to potentially utilise the Study Area.

Opportunities exist for any displaced hollows to be collected and transported for use as valuable habitat in off-site fauna conservation activities. This could effectively provide a positive outcome for endemic threatened fauna species as a result of Project workings.

“Removal of dead wood and dead trees”

The Project will require the removal of ground debris in areas of disturbance. This has the potential to impact upon the Masked Owl, Spotted Tail Quoll, Eastern False Pipistrelle, Eastern Pygmy Possum, Squirrel Glider and Brown Treecreeper (DEC 2004b). Reptiles, frogs and ground foraging birds may be affected by the removal of this habitat. However, a vast amount of ground debris exists in the area surrounding the Project Application Area, particularly as a result of logging activities within the State Forest. It is therefore unlikely that the relatively small disturbance to ground debris as a result of the Project would contribute to this process.

Opportunities exist for displaced ground debris to be collected and transported for use as valuable habitat in off-site fauna conservation activities. This could effectively provide a positive outcome for endemic threatened fauna species as a result of Project workings.

“Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands”

The Project requires the clearing of a small area (4 ha) along a ridgeline and therefore has the potential to increase and alter natural overland flow. Any alteration may, in turn, impact upon surrounding swamp communities located within the adjacent valleys. However, under the premise that the stringent erosion and sedimentation controls developed (GSSE, 2012) are effectively adhered to and given that 2.34 ha of the cleared areas will be rehabilitated post construction, the contribution of clearing activities to this KTP will be minimised and it is unlikely that the Project would contribute to this process.

5.0 Additional Legislative Considerations

5.1 Considerations under the State Environmental Planning Policy 44 – Koala Habitat Protection

5.1.1 First Consideration – is the Land subject to SEPP-44?

The Study Area is located within Greater Lithgow LGA which is listed within Schedule 1 of State Environmental Planning Policy 44 (SEPP 44) – ‘Koala Habitat Protection’. Therefore SEPP-44 applies to the land.

5.1.2 Second Consideration – is the Land ‘Potential Koala Habitat’?

Schedule 2 of the State Environmental Planning Policy 44 (SEPP 44) – ‘Koala Habitat Protection’ lists 10 tree species that are considered indicators of ‘Potential Koala Habitat’. The presence of any of the species listed on a site proposed for development triggers the requirement for an assessment for ‘Potential Koala Habitat’. SEPP 44 defines potential Koala Habitat as:

“areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component”.

No Schedule 2 feed tree species were recorded within the Study Area, however one feed tree species, *Eucalyptus viminalis*, does occur sporadically across the vegetation communities located within the Study Area. This species is found at densities less than 15% of the total number of trees, therefore the Study Area and its surrounds do not constitute Potential Koala Habitat and no further provisions of this policy apply. Importantly, given the nature of the Project and limited impacts on vegetation and in turn habitat, it is considered unlikely that impacts to the Koala would result.

5.2 Considerations under the Environment Protection and Biodiversity Conservation Act 1999

Considerations have been made under the *EPBC Act 1999*. An EPBC Act Protected Matters Search was undertaken within the SEWPAC on-line database (accessed 22/3/2012) to generate a list of those Matters of National Environmental Significance (MNES) from within 10 km of the Study Area, which may have the potential to occur within the Study Area. This data, combined with other local knowledge and records, was utilised to assess whether the type of activity proposed within the Project Application Area will have, or is likely to have a significant impact upon any MNES, or on the environment of Commonwealth land.

Commonwealth Land

The land within the Study Area is not owned by the Commonwealth, and hence this portion of the Act is not applicable.

World Heritage Properties

The Study Area is not a World Heritage Property; however The Gardens of Stone National Park which forms part of the Greater Blue Mountains Area of NSW (a World Heritage Property) is located approximately 7 km to the north of the Study Area. It is expected that the Project will not have a significant impact upon The Greater Blue Mountains Area of NSW.

National Heritage Places

The Study Area is not a National Heritage Place; however The Greater Blue Mountains Area of NSW (a National Heritage Place) is located approximately 7 km to the north of the Study Area. It is expected that the Project will not have a significant impact upon The Greater Blue Mountains Area of NSW.

Wetlands protected by international treaty (the Ramsar convention)

There are no wetlands protected by international treaty (the Ramsar convention) arising from the EPBC Act Protected Matters Report generated for an area within 10 km of the Study Area.

Nationally listed threatened species and ecological communities

Thirty one threatened species and two Threatened Ecological Communities are considered to potentially occur (TEC) within 10 km of the Study Area (EPBC Protected Matters Search). However, Seven threatened fauna species and two threatened flora species (listed under the *EPBC Act 1999*) are considered to have potential to occur, or do occur, within the Study Area. (see Table 4-1 for likelihood of occurrence of threatened species listed under *EPBC Act 1999*).

The threatened flora and fauna listed under the EPBC Act with the potential to occur within the Study Area include:

Flora

- *Persoonia acerosa* (Needle Geebung)
- *Persoonia marginata*

Fauna

- Giant Burrowing Frog
- Southern Barred Frog, Stuttering Frog
- Regent Honeyeater
- Large-eared Pied Bat
- Spotted-tailed Quoll
- Brush-tailed Rock-wallaby
- Koala

The potential for impact upon the species listed above are assessed individually below in Section 6.

Nationally listed migratory species

A total of 15 migratory species listed under the *EPBC Act 1999* have been recorded or have suitable habitat within at least a 10 km radius of the Study Area. The Project is unlikely to substantially modify, destroy or isolate an area of important habitat, result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat or seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

All nuclear actions

No type of nuclear activity is proposed for the Study Area.

The environment of Commonwealth marine areas

No Commonwealth marine areas exist within or adjacent to the Study Area.

Summary Statement:

Based on the above, it is considered the current project is unlikely to result in significant impact on Matters of National Environmental Significance (MNES). It is therefore reasonable to conclude that this project would not result in a Controlled Action with SEWPAC.

No other considerations under the EPBC Act 1999 are deemed likely to have a significant impact on MNES.

6.0 Potential Impacts

6.1 Threatened Flora

A range of threatened flora species were detected or are expected to occur within the proximity of the Study Area. These include:

- *Galium australe*
- *Persoonia acerosa*
- *Persoonia hindii*
- *Persoonia marginata*

The potential for impact upon the species listed above are assessed individually below;

***Persoonia acerosa* (Needle Geebung)**

Persoonia acerosa is an erect shrub between 1 and 2 m with characteristic needle-like leaves that are deeply channelled above. It has been recorded in dry-sclerophyll forest, low scrubby-woodland and heath growing on low-fertility soils. This species prefers open habitat with lower competition and increased light, hence its presence in roadside habitats. It occurs on the Central Coast and in the Blue Mountains largely in the Katoomba, Wentworth Falls and Springwood areas, but once occurred as far north as Mount Tomah where it is now considered to be absent.

P. acerosa was not detected during field surveys yet this species has suitable habitat on site and has the potential to occur on site within the Study Area on the ridge line habitat. However, this species is not cryptic and therefore is likely to have been detected during field surveys. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Persoonia hindii

Persoonia hindii was detected during the current field surveys. During the current field survey for bore 8, 1,649 individual plants were recorded in the vicinity of the Study Area.

A total of approximately 93 *P. hindii* individuals are expected to be removed across the Project Application Area for the access road construction for Bore 8. A total of 4 ha of suitable habitat will be removed across the Project Application area, however 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase.

For context purposes, RPS is aware that approximately 10,600 individual plants have been recorded approximately 500 m from the Study Area (adjacent to Sunnyside Ridge Road) by RPS for another project in 2012. This translates to up to 25,000 hectares of habitat across the Newnes Plateau.

Due to the presence of over 12,000 individual *P. hindii* plants within 2.8 km of the current Project, the removal of 93 plants (or less than 0.8% of the local population) is not expected to result in a significant impact on the future viability of *P. hindii* in the local area. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Persoonia marginata

Persoonia marginata is found on the Central Tablelands and South Coast of NSW, including in the Ben Bullen State Forest. Its preferred habitat is dry sclerophyll forest. This species has been recorded within 10 km of the Study Area (Wildlife Atlas, 2012). Although *P. marginata* was not detected during field surveys this species has suitable habitat on site and has the potential to occur on site and be affected by the Project. However, this species is not cryptic and therefore is likely to have been detected during field surveys. Given that *P. marginata* is not a cryptic species and should have been distinctive and apparent at the time of surveys. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Galium australe

A known population occurs within Bird's Rock Flora Reserve on the Newnes Plateau. RPS targeted flora surveys detected what was thought to be this species at two locations within the Subsidence Assessment Area. This was done by targeting the known record (NSW Atlas Data Base) within close proximity to the site (approximately 2km north of bore 8) after visiting that known site an additional record was recorded within 200m of the Atlas record. However, plant specimens were taken and sent off to the Royal Botanic Gardens for identification and this resulted in identification of a very similar species namely *Galium leiocarpum* syn. *G. propinquum* (refer to Appendix 4 for the identification letter) Both records occurred approximately 200m apart within MU7 Newnes Plateau Narrow-leaved Peppermint – Mountain Gum – Brown Stringybark Layered Forest. Whilst there was a potential for *G. australe* to occur within the Study Area, it was not detected during targeted surveys.

Given the precautionary approach it can be assumed that the Atlas record was correct and based on this assumption it can still be stated that no potential specimens of *G. australe* exist within the Study Area. Therefore, it is unlikely that they will be subject to any direct or indirect effects as a result of the surface works. Furthermore, extensive suitable habitat occurs in the surrounding area. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

6.2 Potential Impacts to Temperate Highland Peat Swamps on Sandstone (THPSS)

Vegetation mapping over the Study Area (DEC 2006) has identified several patches of Newnes Plateau Shrub Swamp (MU 50) and Newnes Plateau Hanging Swamp (MU 51) approximately 100 – 300m away from the Project Application Area. These communities correspond to the Temperate Highland Peat Swamps on Sandstone (THPSS) vegetation community which is listed as a TEC within the EPBC Act 1999.

The distances between the small-scale clearing activities proposed for this Project and THPSS in the vicinity are deemed adequate to prevent impacts occurring in these areas. Provided that adequate erosion and sedimentation controls developed for this Project (GSSE, 2012) are adhered to, there is unlikely to be any impact on these areas as a result of the Project.

The following general recommendations should be implemented to ensure that no detrimental impacts occur to the THPSS:

- Clearing should be maintained to an absolute minimal area fit for the project purpose;
- The detailed Sediment and Erosion Control Plan (GSSE, 2012) should be effectively implemented to

ensure that no erosion and / or sediment liberation occurs as a result of the proposed construction;

- An environmental induction to construction staff should occur by an environmental officer or ecologist prior to works commencing.

Furthermore, ongoing monitoring should be carried out so that where the potential for impacts are identified, measures may be adopted to mitigate and minimise these impacts. This is in the overall interests of the protection and understanding of these species and their habitats.

6.3 Threatened fauna

A range of threatened fauna were detected or are expected to occur within the proximity of the Study Area. These include:

- Giant Burrowing Frog
- Southern Barred Frog, Stuttering Frog
- Regent Honeyeater
- Gang Gang Cockatoo
- Brown Treecreeper
- Varied Sittella
- Little Eagle
- Little Lorikeet
- Powerful Owl
- Scarlet Robin
- Flame Robin
- Masked Owl
- Sooty Owl
- Koala
- Eastern Pygmy Possum
- Large Eared Pied Bat
- Spotted -tailed Quoll
- Eastern False Pipistrelle
- Eastern Bent Wing Bat
- Yellow Bellied Glider
- Squirrel Glider
- Yellow Bellied Sheathtail Bat
- Greater Broad Nosed Bat

The potential for impact upon the species listed above are assessed individually below;

Giant Burrowing Frog (*Heleioporus australiacus*)

The current distribution of *H. australiacus* is south-eastern NSW to Vic. Locally it occurs north to Jervis Bay (Daly 1996), and is mostly restricted to sandy creek banks, often in association with crayfish burrows in this area (Robinson 1996). The northern population has a marked preference for sandstone ridge-top habitat and broader upland valleys. In these locations the frog is associated with small headwater creek lines and along slow flowing to intermittent creek-lines. *H. australiacus* is grey to dark chocolate brown or black above with a white belly, a few yellow spots along the flanks. During the summer, males call like an owl hoot, from burrows within creek banks. Females lay eggs in a foamy nest in the burrow, and the developing tadpoles are washed from the burrows into the creeks during heavy rain.

This species was not detected during targeted field surveys, however it has been recorded twice within the vicinity of the Study Area during monitoring surveys in recent years, including a site near Angus Place Longwall 900W at Kangaroo Creek (Denny 2011). Additional scattered records occur throughout the Blue Mountains National Park. Woodland habitat within the Study Area may provide suitable substrates for the burrowing habits of this species; however, the stream characteristics (running water) are not suited to the breeding requirements of this species. However its occurrence within the Study Area cannot be entirely discounted at non breeding times, thus this species could potentially occur within the Study Area.

Giant Burrowing Frog may occur within the Study Area in non breeding habitat. However, the Project is unlikely to have a direct or indirect impact upon a significant amount of habitat provided adequate sediment control measures (as developed by GSSE (2012)) are implemented and maintained. Consequently, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Southern Barred Frog (*Mixophyes balbus*)

Southern Barred Frog is found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Breeds in streams during summer after heavy rain, outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Eggs are laid on rock shelves or shallow riffles in small, flowing streams.

Southern Barred Frog may occur within the Study Area in non breeding habitat. However, the Project is unlikely to have a direct or indirect impact upon a significant amount of habitat provided adequate sediment control measures (developed by GSSE (2012)) are implemented and maintained. Consequently, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Regent Honeyeater (*Anthochaera Phrygia*)

Regent Honeyeaters occur in temperate woodlands and open forest, including forest edges. Seasonal movements appear to be dictated by the flowering of various species of Eucalyptus sp. that are characteristic of the dry forests and woodlands of South-Eastern Australia. The Regent Honeyeater prefers to forage on large-flowered Eucalypts. They also forage on mistletoe and Banksia flowers, and

arthropods. Nesting occurs mainly between November and January, but breeding has been recorded in all months between July and February.

This species was not detected during targeted field surveys. Well known as occurring in the Capertee area, individuals are recorded in more easterly habitat, particularly in areas characterised by winter flowering *Eucalyptus* spp. when westerly habitats are experiencing extended dry periods. As such this species may occur in Newnes Plateau forests on an intermittent basis. Given this a precautionary approach can be taken and presence is assumed to be within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Gang-Gang Cockatoo (*Callocephalon fimbriatum*)

Gang-Gang Cockatoos are found in the summer months in tall mountain forests and woodlands, and mature wet sclerophyll forests. In winter, they may occur at lower altitudes in drier more open *Eucalypt* forests and woodlands, and often found in urban areas in some districts.

The species was recorded within approximately 1km of the Study Area. Although foraging habitat occurs widely within the Study Area and the wider locality, the Study Area provides limited breeding opportunities due to the relatively low density of large breeding hollows suited to this species for breeding purposes. Given this a precautionary approach can be taken and presence is assumed to be within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Brown Treecreeper (*Climacteris picumnus victoriae*)

The Brown Treecreeper frequents drier forests and woodlands, particularly open woodland lacking a dense understorey. Also found in grasslands in proximity to wooded areas where there are sufficient logs, stumps and dead trees nearby. The species feeds on invertebrate larvae and small insects, particularly ants, and utilises hollows for roosting/nesting. The Brown Treecreeper appears not to persist in remnants less than 200ha.

A number of records exist on the Newnes Plateau to the northwest of the Study Area (Atlas of NSW Wildlife Data 2012). This species was not detected during targeted field surveys. However, there are a large number of records of the species within the area and potential habitat occurs within the Study Area. Therefore, this species has potential to occur within the Study Area. Given this a precautionary approach

can be taken and presence is assumed to be within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Varied Sittella (*Daphoenositta chrysoptera*)

The Varied Sittella is a canopy species occurring across a wide variety of wooded habitats including wet and dry forests / woodlands and in some areas, tall heathlands. It forages for a range of invertebrate prey and differs from Treecreeper species in foraging in both up and down orientations on trunks and branches. The species occurs widely across mainland Australia in suitable habitat.

This species has previously been recorded within 10km of the Study Area by RPS staff during 2010. A precautionary approach can therefore be taken and presence is assumed to be within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Little Lorikeet (*Glossopsitta pusilla*)

Glossopsitta pusilla extends from Cairns to Adelaide coastally and to inland locations. Commonly found in dry, open eucalypt forests and woodlands, yet can be found in roadside vegetation to woodland remnants. *G. pusilla* feeds on abundant flowering Eucalypts, but will also take nectar from *Melaleuca* sp and species of Mistletoe. *Eucalyptus albens* (White Box) and *E. melliodora* (Yellow Box) are favoured food sources on the western slopes in NSW. On the eastern slopes and coastal areas favoured food sources are *Corymbia maculata* (Spotted Gum), *E. fibrosa* (Broad-leaved Ironbark), *E. robusta* (Swamp Mahogany) and *E. pilularis* (Blackbutt). Nesting takes place in hollow bearing trees.

This species was not detected during targeted field surveys. A wide ranging species in wooded areas across eastern Australia due to its nectivorous habits, this species may use surrounding forests and woodlands for foraging purposes on at least a seasonal basis. Therefore, this species could potentially occur within the Study Area. Given this a precautionary approach can be taken and presence is assumed to be within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is

considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Powerful Owl (*Ninox strenua*)

This species occurs in coastal and adjacent ranges of eastern Australia in sclerophyll forests and woodlands where suitable prey species occur (being predominantly arboreal mammals such as gliders and flying foxes, but also preys on birds). The Powerful Owl requires large and specific hollow characteristics for nesting. Pairs appear to mate for life and occupy exclusive territories in the order of 1000 ha in size.

This species was not recorded within the Study Area during fieldwork, however it has been recorded within 10km of the Study Area during RPS surveys in 2012. It is therefore likely that the Study Area occurs within the foraging range and perhaps the breeding territory of locally occurring Powerful Owl individuals. Therefore, this species could potentially occur within the Study Area. Despite this, due to the long history of logging practices within the Study area, the general paucity of large hollows places limitations on breeding opportunities within the Study Area. A precautionary approach can be taken and presence is assumed to be within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat (with higher densities of hollow bearing trees for breeding) nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Scarlet Robin (*Petroica boodang*)

Scarlet Robins are a woodland and open forest species, which forages in the mid to lower stories on a variety of invertebrate prey. Generally an altitudinal migrant the Scarlet Robin spends the warmer months in the ranges and winters in lowland dry open forests and woodland. Scarlet Robins have a patchy distribution in eastern Australia across wooded habitats.

The species was recorded within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Flame Robin (*Petroica phoenicea*)

Flame Robins are a woodland and open forest species, which prefers the wooded edges of open areas and forages in the lower storey on a variety of invertebrate prey. Generally an altitudinal migrant, the Flame Robin, like a number of other robin species spends the warmer months in the ranges and winters

in more lowland open country and woodlands. This species is usually encountered in high altitudinal areas including above snowline habitat in some regions.

This species was located within 1km of the Study Area during previous RPS surveys and is therefore considered likely to utilise the Study Area as part of its foraging and/or breeding habitat. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Masked Owl (*Tyto novae-hollandiae*)

This species is found in a range of habitats but is more commonly found in dry eucalypt forests and woodlands. This forest owl often hunts on forest edges and roadsides but requires large eucalypt hollows for nesting, with these hollows also being preferred for roosting sites. Breeding has also been recorded in caves.

This species was recorded within the Study Area during fieldwork by RPS (2012). It is likely that the Study Area is utilised as a foraging range and perhaps the breeding territory of locally occurring individuals. Although this species occurs within the Study Area, due to the long history of logging practices within the Study area the general paucity of large hollows places limitations on breeding opportunities within the Study Area. In addition, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. Given that there are larger areas of more suitable habitat (with higher densities of hollow bearing trees for breeding) nearby (Newnes Plateau is ~25,000 hectares), the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Sooty Owl (*Tyto tenebricosa*)

Sooty Owls occur in tall, moist eucalypt forests and rainforests of the escarpment, eastern tablelands and coastal areas of NSW. They are found in areas of steep and/or undulating topography however, they are strongly associated with sheltered gullies with a typically tall, rainforest understory.

This species was recorded within 10km of the Study Area by RPS during fieldwork in 2012. It is therefore likely that the Study Area occurs within foraging and potentially breeding territory of locally occurring Sooty Owl individuals. Therefore, this species could potentially occur within the Study Area. Despite this, due to the long history of logging practices within the Study area the general paucity of large hollows places limitations on breeding opportunities within the Study Area. In addition, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase

and will therefore only be a temporary impact. Given that there are larger areas of more suitable habitat (with higher densities of hollow bearing trees for breeding) nearby (Newnes Plateau is ~25,000 hectares), the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Little Eagle (*Heiraaetus morphonoides*)

The Little Eagle is found throughout the Australian mainland except in the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW, Occupying open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also utilised. The species nests in tall living trees within a remnant patch where pairs build a large stick nest in winter. It preys on birds, reptiles and mammals, occasionally adding large insects and carrion (DECCW 2010).

This species was not recorded within the Study Area during fieldwork yet is known to occur in open eucalypt forest and has been previously recorded from the Newnes Plateau. Given that the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature and there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares), the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Koala (*Phascolarctos cinereus*)

Koalas occur throughout Eastern Australia, including Queensland, New South Wales, Victoria and South Australia in more productive forests and woodlands where they require suitable feed trees (particular *Eucalyptus* spp.) and habitat linkages. Populations are impacted upon by collisions, dog attacks, fires, habitat destruction and disease. There is a north-south range retraction with significant declines occurring in New South Wales and Queensland, however southern populations are more stable. This species has been recorded on one occasion on the Newnes Plateau.

Schedule 2 of the State Environmental Planning Policy 44 (SEPP 44) – ‘Koala Habitat Protection’ lists 10 tree species that are considered indicators of ‘Potential Koala Habitat’. The presence of any of the species listed on a site proposed for development triggers the requirement for an assessment for ‘Potential Koala Habitat’. SEPP 44 defines potential Koala Habitat as:

“areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component”.

One Schedule 2 feed tree species (*Eucalyptus viminalis*) was recorded within the Study Area at densities of less than 15% of the total number of trees, therefore the Study Area does not constitute Potential Koala Habitat and no further provisions of this policy apply. Importantly given the nature of the proposal and likelihood of impacts on vegetation and in turn habitat, it is considered unlikely that impacts to the Koala would result.

Although Koalas have potential to occur within the Study Area they were not detected during field work. The proposed Project Application Area (direct surface impacts) is narrow and linear in nature. In addition, there are larger areas of preferred habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of suitable habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern Pygmy Possum (*Cercartetus nanus*)

Eastern Pygmy Possums occur from rainforest through sclerophyll forest to tree heath. Favoured food for the species includes banksias, myrtaceous shrubs and trees, and insects. Nesting sites are generally in drier habitats (Strahan, 1995a) Records exist from the Newnes Plateau (Atlas of NSW Wildlife data).

This species was not recorded within the Study Area during fieldwork. However, this species has been recorded within close proximity to the Study Area (approximately 1.5km) by RPS (2012). Therefore, this species could potentially occur within the Study Area. Given this, a precautionary approach can be taken and presence is assumed to be within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Large-eared Pied Bat (*Chalinolobus dwyeri*)

This species is likely to occur and has been recorded near Carne West Swamp by Biodiversity Monitoring Services during seasonal monitoring and by RPS (2010). *C. dwyeri* is found in well-timbered areas containing gullies and possess relatively short, broad wings that indicate manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy and would be wide-ranging throughout the Newnes Plateau. Ongoing monitoring of the woodland habitat preferred by the Large-eared Pied Bat within previously extracted areas has shown that it is not affected by subsidence from the Angus Place Mine.

Given that the species was previously recorded within 10km of the Study Area, there is potential for the Large-eared Pied Bat to utilise the Study Area as breeding and/or foraging habitat. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there are larger areas of suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of suitable roosting or feeding habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Spotted-tailed Quoll (*Dasyurus maculatus*)

Found in a variety of forested habitats from sclerophyll forests to rainforests and coastal woodlands. This species creates a den in fallen hollow logs or among rocky outcrops and generally does not occur in

otherwise suitable habitats that are in close proximity to urban development. A number of records occur across the Newnes Plateau, however no records exist for within 10km of the Study Area (Atlas of NSW Wildlife data). It is an opportunistic hunter of a variety of prey.

This species was not recorded within the Study Area during fieldwork. However, this species has been recorded within the Newnes Plateau and suitable habitat occurs within the Study Area. Therefore, Spotted-tailed Quolls may occur within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there are larger areas of suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of suitable habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)

This species is found in a variety of forest types such as open forests, woodlands and wetter sclerophyll forests (usually with trees >20m). This species roosts in tree hollows and hunts beetles, moths, weevils and other flying insects below or just above the canopy.

This species was recorded within 10km of the Study Area by RPS staff (2010). Suitable habitat for this species exists within the Study Area, therefore this species is likely to occur within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there are larger areas of suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of suitable habitat. It is subsequently considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern Bentwing Bat (*Miniopterus schreibersii* subsp. *oceanensis*)

Eastern Bentwing Bats prefer to forage in well-vegetated areas, such as within wet and dry sclerophyll forests and rainforests and also dense coastal Banksia scrub. This species require caves or similar structures for roosting habitat, although they occasionally roost in tree hollows. They are largely confined to more coastal areas, often found roosting with *Miniopterus schreibersii* (Eastern Bentwing-bat).

This species was not recorded within the Study Area during fieldwork, although potential foraging and roosting habitat are widespread within the locality. Also due to its mobility, it has the potential to occur within the Study Area on at least an intermittent basis. Although this species has potential to occur within the study area it has a low likelihood of roosting within the Study Area because of a lack of cave structures and would have more suitable habitat within the surrounding areas. In Addition, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. Therefore, it is considered that the proposed

development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Yellow-bellied Glider (*Petaurus australis*)

Yellow-bellied Gliders are usually associated with tall, mature wet Eucalypt forest usually with high rainfall and nutrient rich soils. Yellow-bellied Gliders are also known from tall dry open forest and mature woodland. In the north of NSW they favour mixed coastal forests to dry escarpment forests and in the south they prefer moist coastal gullies to creek flats and tall montane forests. The diverse diet of this species is primarily made up of Eucalypt nectar, sap, honeydew, manna and invertebrates found under decorticated bark and pollen. Tree hollows for nest sites are essential, as are suitable food trees in close proximity.

This species was not recorded within the Study Area during fieldwork. There are few records for this species in the wider locality. Chance of occurrence is low, but cannot be entirely discounted. Therefore, this species could potentially occur within the Study Area. However, due to the long history of logging practices within the Study Area the general paucity of tree hollows places limitations on availability of suitable nest sites within the Study Area. In Addition, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Squirrel Glider (*Petaurus norfolcensis*)

Squirrel Gliders occur in eucalypt forests and woodlands where it feeds on sap exudates and blossoms. In these areas tree hollows are utilised for nesting sites. Also requires winter foraging resources when the availability of normal food resources may be limited, such as winter-flowering shrub and small tree species.

Although suitable habitat for this species occurs within the Study Area, it or its close relative the Sugar Glider were not observed during nocturnal spotlighting surveys or arboreal trapping. As suitable habitat occurs within the Study Area, it has the potential to occur within the Study Area, however the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there are larger areas of suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of suitable habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*)

Yellow-bellied Sheath-tail-bats inhabit a range of habitats from rainforest to arid shrubland. They roost in tree-hollows and sometimes roost in mammal burrows when no hollows are available. Seasonal

movements are unknown and they may migrate to southern Australia in summer. Yellow-bellied Sheath-tail-bats feed by foraging for insects over the canopy, but fly low in arid shrubland.

This species was recorded within 2km of the Study Area during fieldwork (RPS 2010, RPS 2012), and potential foraging and roosting habitat are widespread within the locality. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there are larger areas of suitable roosting habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of suitable roosting and foraging habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Greater Broad-nosed Bat (*Scoteanax rueppellii*)

Greater Broad-nosed Bats forage in moister gullies and wet sclerophyll forests as well as in lightly wooded areas and open spaces/ ecotones, most commonly found in tall wet forest. Open woodland and dry open forest habitat suits the direct flight of this species as it searches for beetles and other larvae. This species roosts in tree hollows, although has been recorded in buildings.

This species was not recorded within the Study Area during fieldwork, although potential foraging and roosting habitat are widespread within the locality. Given its mobility it has the potential to occur within the Study Area on at least an intermittent basis. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there are larger areas of suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of suitable roosting and foraging habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

6.4 Groundwater Dependent Ecosystems (GDEs)

The NSW Groundwater Dependent Ecosystem (GDE) Policy (DLWC 2002) is part of a coordinated strategy at Commonwealth, State and local levels and is specifically designed to protect ecosystems which rely on groundwater for their survival, so that wherever possible the ecological processes and biodiversity of these dependent ecosystems are maintained or restored. The policy provides guidance on how to protect and manage these valuable natural systems in a practical sense. The range of tools includes a rapid assessment process that provides information on the type and susceptibility of the GDE being assessed. This assessment also provides information on the strengths, weaknesses and opportunities for preserving and managing GDEs.

Map Units 50 - Newnes Plateau Shrub Swamp (NPSS) and 51 - Newnes Plateau Hanging Swamp (NPHS; which do not occur within the Study Area) are vegetation communities classified as GDEs as they are at least partially dependent on the groundwater sourced from the locally occurring bedding planes with permeable and impermeable layers.

A rapid assessment of the GDEs known in the local area in accordance with the NSW Groundwater Dependent Ecosystem Policy is as follows:

6.4.1 Geographical Area

The NPSS and NPHS vegetation communities occur within the Newnes Plateau and associated drainage lines to the north-east of Lithgow in NSW.

6.4.2 Types of GDEs Present

The GDEs within the locality of the Study Area were assessed in detail by Connell Wagner (2005 in Centennial Angus Place Pty Ltd 2005) of the Subsidence Management Plan (SMP) produced by Centennial Angus Place Pty Ltd (2005). The following is an extract from Connell Wagner (2005 in Centennial Angus Place Pty Ltd 2005):

“Generally, shrub swamps have developed in the application area at altitudes in excess of 1100 metres, in valleys underlain by Narrabeen Group strata. The swamps develop in areas which are subject to a constant supply of water - both groundwater and surface runoff.

The groundwater source is initiated when rainfall infiltrates the sandy soils and the sandstone on the adjacent ridges. At relatively shallow depths in the sandstone is a thin layer of claystone, or tightly cemented sandstone which is impervious to vertical groundwater percolation and forms an aquitard. The groundwater, when it meets this impermeable barrier, travels laterally until it reaches the edge of the impervious layer, which has been exposed by geological erosion in an adjacent valley. In conjunction with rainfall runoff, this produces a condition of constant moisture, which has allowed a range of plant species to gradually colonise these sites over long periods of time, forming a rare plant community.

The constant saturation of the valley floor creates anaerobic (oxygen starved) conditions in the soil, which inhibit the microbial breakdown and decomposition of dead plant material. This organic matter accumulates in a partly decomposed state as peat. Peat has an extraordinary ability to absorb water, and so the swamp soil acts as a sponge, retaining much rainwater for later slow release. The peat is generally mixed with sand derived from the weathering of the soft sandstone on the ridges, which is washed into the valley by rainfall run-off.

Since the shrub swamps are supplied by two water sources (rainfall runoff and groundwater), and they store large quantities of water, they are resistant to some extent to natural variations in flow from either of the water sources (eg drought conditions will reduce runoff). In general, rainfall runoff provides the greatest water volume to the swamps. Normally, between 20% and 30% of the total rainfall in the area runs off the ground surface and into the swamps. When this occurs, any voids in the dry peat at the surface soak up the water, and any excess runoff flows down the creek channel and into the Wolgan River.

In contrast, less than 5% of rainfall infiltrates the ground surface and enters the groundwater system. Most of this water then enters the swamp by seepage at the margins, although a small proportion leaks through the aquitard and into the underlying strata. Unlike rainfall, the seepage is continuous, and is proportional to the hydraulic head in the aquifer beneath the flanking ridges. During droughts, the seepage from the aquifer keeps the swamp supplied with groundwater, albeit at a reduced rate, so that under normal climatic conditions, the plants are continuously supplied with water.”

The NPSS and NPHS vegetation communities are classified as 'Wetlands' according to the criteria in Section 2.3 of the NSW Groundwater Dependent Ecosystem Policy (DLWC 2002).

The type of groundwater system is classified as a Sedimentary Rock Aquifer according to Section 2.4 of the NSW Groundwater Dependent Ecosystem Policy (DLWC 2002).

6.4.3 Vulnerability of the GDEs

The NPSS and NPHS GDEs are highly dependent on the continuous flow of groundwater into the swamps. The swamps themselves are situated on deep beds of peat which absorb and hold large quantities of water which is slowly released over time to the lower catchment. These GDEs are reliant on the groundwater infiltration to a greater extent than overland flow resulting from rainfall events. The recharging and holding of large amounts of water by the surrounding geology as well as the peat within the swamps and the subsequent very slow release of the water by the geology and swamp ensure that a constant flow of water is permeating the area.

6.4.4 Assess the value of the GDEs

The NPSS and NPHS vegetation communities are very valuable from several viewpoints:

- These vegetation communities provide the only known habitat for the Blue Mountains Water Skink (*Eulamprus leuraensis*) which is listed as an endangered species under the NSW *TSC Act 1995* and as an endangered species under the Commonwealth *EPBC Act 1999*.
- These vegetation communities provide high value habitat or resources for a number of flora and fauna species and provide a refuge during times of drought due to the water holding capacity of the underlying peat.
- The NPSS and NPHS vegetation communities act as repositories for nutrients by absorbing them and converting them into vegetation or otherwise locking or trapping these nutrients within the natural processes within the swamps.
- The swamp communities act as large filters by removing nutrients and minerals from the water.
- The swamp communities have a high aesthetic value.

6.4.5 List management tools for protecting and managing GDEs

Management tools for GDEs within the Newnes Plateau area are generally those of retention, buffering and monitoring within the Newnes State Forest. These strategies are utilised by Forests NSW in addition to several underground mining companies within the area. NPSS and NPHS have a high priority with respect to conservation and every effort to avoid significant impacts of any type are taken by these industries. Threats to these communities include: mining for coal leading to changes to the hydrology of catchments and the associated swamps and severe and rapid erosion, roadworks, quarrying and periodic timber harvesting from adjacent plantations all leading to incremental clearing, fragmentation, erosion and sedimentation, invasion of exotic species, including species of *Pinus*, and changes to fire regimes.

Forests NSW have standard operating procedures for selective logging which include buffers located around any steep slopes and also creeklines. These buffers are not logged and are left in their natural state to control erosion and avoid any impacts such as sedimentation of creeklines. In addition the practice of selective logging ensures that areas of vegetation are not clear-felled which contributes to negative impacts on creeklines and associated swamps.

Centennial Springvale Pty Ltd has a comprehensive water table monitoring program in place as well as regular monitoring of flora and fauna within its lease area. This enables collection of a large amount of data that is collated, analysed and presented within an annual monitoring report.

6.4.6 Prioritise Management Actions

Management actions such as the retention and buffering around the swamp vegetation communities within the Newnes State Forest will retain these communities in an as near natural state as possible. Regular monitoring provides comprehensive data for use in determining if any changes are taking place. These management actions are at present the least invasive or damaging and are also the most cost effective. If any change is detected within the environment of the swamp vegetation communities then active remedial action is an option, however, it is expected that this will be costly and will require very strict procedures and monitoring to achieve. Presently the status of the NPSS and NPHS communities has been maintained within expected annual and longer term climatic changes (such as the recent drought).

6.4.7 Implement Management Actions

All management actions that are conceivably possible are presently being enacted. This comprises of retention, monitoring, research and planning for minor impacts as a result of the Project.

Pro-active management such as water allocations, water rights and the like do not apply to these GDEs as there is no water extraction proposed for the swamps or the associated groundwater flows.

6.4.8 Review of management actions

It is essential to review management actions to assess their effectiveness. Changes may need to be reflected in management actions to bring about greater resource protection. Reviews should be undertaken at regular intervals of 2 years or at the most every 5 years. This review should consider the extent to which the management actions were implemented and whether they have succeeded in achieving their goals.

7.0 Part 3A Key Thresholds Assessment

As required by the Draft Guidelines for Threatened Species Assessment for Part 3A Applications (DEC / DPI 2005), the following assessment of Key Thresholds is provided for the Project.

The following threatened flora may occur within the vicinity of the Study Area:

- *Persoonia hindii*
- *Galium australe*
- *Persoonia acerosa*

The following threatened fauna may occur in the vicinity of the Study Area:

- Giant Burrowing Frog
- Stuttering Frog
- Regent Honeyeater
- Gang Gang Cockatoo
- Brown Treecreeper
- Varied Sittella
- Little Eagle
- Little Lorikeet
- Powerful Owl
- Scarlet Robin
- Flame Robin
- Masked Owl
- Sooty Owl
- Koala
- Eastern Pygmy Possum
- Large Eared Pied Bat
- Spotted Tail Quoll
- Eastern False Pipistrelle
- Eastern Bent Wing Bat
- Yellow Bellied Glider
- Squirrel Glider
- Yellow Bellied Sheath-tail Bat
- Greater Broad Nosed Bat

Whether or not the Proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values.

The Project is unlikely to reduce the viability of any species, population or ecological community, given the low level of impact and the extensive expanse of similar habitat (the Newnes Plateau covers an area of ~25,000 hectares) in the broader locality. No TECs will be cleared for this Project, with all areas of THPSS being retained.

Flora species

Due to the clearing of a relatively small 4 ha of native vegetation and the rehabilitation of 2.34 ha after the initial construction phase, the retention of the majority of *P. hindii* plants and no other removal of threatened flora species, any impact on flora biodiversity values of the area will be negligible.

Fauna species

Due to the removal of a relatively small 4 ha of native vegetation and the rehabilitation of 2.34 ha after the initial construction phase, the Project is unlikely to affect the biodiversity values of the area in the long term.

2. Whether or not the Proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community.

The Project is unlikely to reduce viability of any species, population or ecological community, given the low level of impact and the extensive expanse of similar habitat in the broader locality. The only threatened flora species proposed to be removed (*P. hindii*) has a local population within 2.8 km of at least 12,000 known plants, with less than 0.8% of that population proposed for removal.

The Project will remove 4 ha of habitat for some threatened fauna species with 2.34 ha of this area to be rehabilitated after the initial construction phase. Due to the proximity of ~25,000 ha of native vegetation on the Newnes Plateau; it is unlikely that the Project will reduce the long term viability of any local population of any threatened fauna species.

3. Whether or not the Proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction.

The removal of the relatively small area of habitat for the Project is considered unlikely to accelerate the extinction or place at risk of extinction any species, population or ecological community, given the extensive expanse of similar habitat in the broader locality.

The proposed direct surface impacts associated with the Project Application Area will result in the removal of ~93 *P. hindii* plants, from a known local population of over 12,000 plants (within 2.8 km of the Study Area).

4. Whether or not the Proposal will adversely affect critical habitat.

There is no declared "Critical Habitat" within the locality, and subsequently the Project will not adversely affect any such habitat.

8.0 Conclusion and Recommendations

8.1 Conclusion

The access road to Bore 8 is mostly already formed and it was considered that the least sensitive route was to utilise existing alignment as the constraints of *P. hindii* are present on both sides of the track and realignment will not result in a significant difference in impacts.

One threatened flora species and two threatened bird species listed under the TSC Act 1995 have been recorded within the Study Area during recent surveys (RPS 2011 and 2012) whilst an additional 23 threatened species have been identified in the locality during monitoring work by Martin Denny. Habitat within the Project Application Area is considered suitable for several other threatened species that may use the area on an intermittent basis.

93 individual *P. hindii* are proposed to be removed in this Project, representing the removal of less than 0.8% of the known population of approximately 12,000 individuals that are located within 2.8km of the Study Area.

A significant impact is considered unlikely to occur to any species, population, or endangered ecological community as a result of the proposal.

8.2 Recommendations

The following recommendations have been outlined to provide ecological guidelines and Study Area management strategies that may prevent any ongoing detrimental impacts upon habitat surrounding the proposed surface mine dewatering facility.

- Sediment and erosion control should be a focus when undertaking access track construction;
- During removal of habitat trees an environmental representative or ecologist should be present to ensure that fauna are handled appropriately;
- Any hollow-bearing trees removed by clearing activities along with valuable fauna habitat within displaced ground debris should be retained and collected for fauna conservation activities off-site;
- Hollow-bearing trees adjacent to Project Application Area boundary be retained where possible;
- Populations of *P. hindii* be avoided where possible;
- All disturbed areas outside of the required functional road and borehole areas should be rehabilitated with endemic native vegetation.
- Adequate sediment control be employed adjacent to all areas of soil disturbance; and
- It is recommended that appropriate measures be employed to ensure that machinery working within the Study Area do not bring materials (soils etc.) onto the Study Areas that may infect onsite vegetation with *Phytophthora cinnamomi*, or cause the distribution of weed species.

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Appendix I

Fauna Species List

Known and Expected Fauna Species List

Below is a list of fauna species that could be *reasonably* expected to be found within the Study Area. Such an approach has been taken given the unlikelihood to record *all* potentially occurring species within an area during formal fauna surveys (due to seasonality, climatic limitations, crypticism etc).

Family sequencing and taxonomy follow for each fauna class:

Birds – Christidis and Boles (1994).

Herpetofauna - Cogger (1996).

Mammals - Strahan (ed.) (1995) and Churchill (1998).

✓ - Species observed or indicated by scats, tracks etc. within the Study Area during this investigation or investigations undertaken within 1km of this Study Area for other projects.

* - Indicates an introduced species

Known and Expected Bird List

Appendix

Key:

1 = Results of ecological investigations conducted within the study area

✓ = Species Detected

* = introduced species

(C) = listed as CAMBA species

(J) = listed as JAMBA species

(E) = listed as Endangered in NSW (TSC Act).

(V) = listed as Vulnerable in NSW (TSC Act).

(EV) = Species listed under the Commonwealth EPBC Act as Vulnerable

(EE) = Species listed under the Commonwealth EPBC Act as Endangered

(EM) = Species listed under the Commonwealth EPBC Act as Migratory

(EMa) = Species listed under the Commonwealth EPBC Act as Marine

Species indicated in **BOLD** font are those threatened species known to occur within Lithgow LGA (Atlas of NSW Wildlife data)

Data

Source:

✓ = Species recorded during this survey or from other RPS surveys that have occurred recently surrounding the Study Area.

Family Name	Scientific Name	Common Name	Recorded
Acanthizidae	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill	
	<i>Acanthiza lineata</i>	Striated Thornbill	✓
	<i>Acanthiza nana</i>	Yellow Thornbill	✓
	<i>Acanthiza pusilla</i>	Brown Thornbill	✓
	<i>Acanthiza reguloides</i>	Buff-rumped Thornbill	
	<i>Aphelocephala leucopsis</i>	Southern Whiteface	
	<i>Calamanthus pyrrhopygius</i>	Chestnut-rumped Heathwren	
	<i>Gerygone fusca</i>	Western Gerygone	
	<i>Gerygone mouki</i>	Brown Gerygone	✓
	<i>Gerygone olivacea</i>	White-throated Gerygone	
	<i>Origma solitaria</i>	Rockwarbler	
	<i>Pycnoptilus floccosus</i>	Pilotbird	
	<i>Pyrrholaemus saggitatus</i>	Speckled Warbler (V)	
	<i>Sericornis citreogularis</i>	Yellow-throated Scrubwren	
	<i>Sericornis frontalis</i>	White-browed Scrubwren	✓
	<i>Sericornis magnirostris</i>	Large-billed Scrubwren	
	<i>Smicronis brevirostris</i>	Weebill	
Accipitridae	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk	
	<i>Accipiter fasciatus</i>	Brown Goshawk	
	<i>Accipiter novaehollandiae</i>	Grey Goshawk	
	<i>Aquila audax</i>	Wedge-tailed Eagle	
	<i>Elanus axillaris</i>	Black-shouldered Kite	
	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	
	<i>Haliastur sphenurus</i>	Whistling Kite	
	<i>Lophoictinia isura</i>	Square-tailed Kite (V)	
Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar	
Alaudidae	<i>Alauda arvensis</i> *	Eurasian Skylark	
	<i>Mirafrja javanica</i>	Horsfield's Bushlark	
Alcedinidae	<i>Alcedo azurea</i>	Azure Kingfisher	
	<i>Dacelo novaeguineae</i>	Laughing Kookaburra	✓
	<i>Todiramphus sanctus</i>	Sacred Kingfisher	
Anatidae	<i>Anas gracilis</i>	Grey Teal	
	<i>Anas rhynchotis</i>	Australasian Shoveler	
	<i>Anas superciliosa</i>	Pacific Black Duck	
	<i>Aythya australis</i>	Hardhead	
	<i>Biziura lobata</i>	Musk Duck	
	<i>Chenonetta jubata</i>	Australian Wood Duck	
	<i>Cygnus atratus</i>	Black Swan	
	<i>Malacorhynchus membranaceus</i>	Pink-eared Duck	
	<i>Oxyura australis</i>	Blue-billed Duck (V)	
Apodidae	<i>Hirundapus caudacutus</i>	White-throated Needletail (EM)	
Ardeidae	<i>Ardea pacifica</i>	White-necked Heron	
	<i>Egretta novaehollandiae</i>	White-faced Heron	
	<i>Nycticorax caledonicus</i>	Nankeen Night Heron	
	<i>Artamus cinereus</i>	Black-faced Woodswallow	
Artamidae	<i>Artamus cyanopterus</i>	Dusky Woodswallow	
	<i>Artamus leucorhynchus</i>	White-breasted Woodswallow	
	<i>Artamus superciliosus</i>	White-browed Woodswallow	
	<i>Cracticus nigrogularis</i>	Pied Butcherbird	
	<i>Cracticus torquatus</i>	Grey Butcherbird	
	<i>Gymnorhina tibicen</i>	Australian Magpie	
	<i>Strepera graculina</i>	Pied Currawong	✓
	<i>Strepera versicolor</i>	Grey Currawong	✓
Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	

Family Name	Scientific Name	Common Name	Recorded
	<i>Cacatua sanguinea</i>	Little Corella	
	<i>Callocephalon fimbriatum</i>	Gang-Gang Cockatoo (V)	
	<i>Calyptorhynchus funereus</i>	Yellow-tailed Black-Cockatoo	✓
	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo (V)	
	<i>Eolophus roseicapillus</i>	Galah	
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	✓
	<i>Coracina papuensis</i>	White-bellied Cuckoo-shrike	
	<i>Coracina tenuirostris</i>	Cicadabird	✓
	<i>Lalage tricolor</i>	White-winged Triller	
Caprimulgidae	<i>Eurostopodus mystacalis</i>	White-throated Nightjar	
Charadriidae	<i>Elseyornis melanops</i>	Black-fronted Dotterel	
	<i>Vanellus miles</i>	Masked Lapwing	
Cisticolidae	<i>Cisticola exilis</i>	Golden-headed Cisticola	
Climacteridae	<i>Climacteris erythrops</i>	Red-browed Treecreeper	
	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies) (V)	
	<i>Cormobates leucophaea</i>	White-throated Treecreeper	✓
Columbidae	<i>Geopelia cuneata</i>	Diamond Dove	
	<i>Geopelia humeralis</i>	Bar-shouldered Dove	
	<i>Geopelia placida</i>	Peaceful Dove	
	<i>Leucosarcia melanoleuca</i>	Wonga Pigeon	
	<i>Macropygia amboinensis</i>	Brown Cuckoo-Dove	
	<i>Ocyphaps lophotes</i>	Crested Pigeon	
	<i>Phaps chalcoptera</i>	Common Bronzewing	
	<i>Phaps elegans</i>	Brush Bronzewing	
Coraciidae	<i>Eurystomus orientalis</i>	Dollarbird	
Corcoracidae	<i>Corcorax melanorhamphos</i>	White-winged Chough	✓
Corvidae	<i>Corvus coronoides</i>	Australian Raven	✓
	<i>Corvus mellori</i>	Little Raven	
Cuculidae	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo	✓
	<i>Cacomantis variolosus</i>	Brush Cuckoo	
	<i>Chalcites basalis</i>	Horsfield's Bronze-Cuckoo	
	<i>Chalcites lucidus</i>	Shining Bronze-Cuckoo	
	<i>Chalcites osculans</i>	Black-eared Cuckoo	
	<i>Cuculus pallidus</i>	Pallid Cuckoo	
	<i>Cuculus saturatus</i>	Oriental Cuckoo	
	<i>Eudynamys orientalis</i>	Pacific Koel	
	<i>Scythrops novaehollandiae</i>	Channel-billed Cuckoo	
Dicaeidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird	✓
Dicruridae	<i>Grallina cyanoleuca</i>	Magpie-lark	
	<i>Monarcha melanopsis</i>	Black-faced Monarch	
	<i>Monarcha trivirgatus</i>	Spectacled Monarch	
	<i>Myiagra cyanoleuca</i>	Satin Flycatcher	
	<i>Myiagra inquieta</i>	Restless Flycatcher	
	<i>Myiagra rubecula</i>	Leaden Flycatcher	✓
	<i>Rhipidura albiscapa</i>	Grey Fantail	✓
	<i>Rhipidura leucophrys</i>	Willie Wagtail	
	<i>Rhipidura rufifrons</i>	Rufous Fantail	
Estrildidae	<i>Lonchura castaneothorax</i>	Chestnut-breasted Mannikin	
	<i>Neochmia modesta</i>	Plum-headed Finch	
	<i>Neochmia temporalis</i>	Red-browed Finch	
	<i>Stagonopleura bella</i>	Beautiful Firetail	
	<i>Stagonopleura guttata</i>	Diamond Firetail (V)	
	<i>Taeniopygia bichenovii</i>	Double-barred Finch	
	<i>Taeniopygia guttata</i>	Zebra Finch	
Eupetidae	<i>Cinclosoma punctatum</i>	Spotted Quail-thrush	✓

Family Name	Scientific Name	Common Name	Recorded
	<i>Psophodes olivaceus</i>	Eastern Whipbird	✓
Falconidae	<i>Falco berigora</i>	Brown Falcon	
	<i>Falco cenchroides</i>	Nankeen Kestrel	
	<i>Falco longipennis</i>	Australian Hobby	
	<i>Falco peregrinus</i>	Peregrine Falcon	
	<i>Falco subniger</i>	Black Falcon	
Fringillidae	<i>Carduelis carduelis</i> *	European Goldfinch	
Hirundinidae	<i>Cheramoeca leucosterna</i>	White-backed Swallow	
	<i>Hirundo neoxena</i>	Welcome Swallow	✓
	<i>Petrochelidon ariel</i>	Fairy Martin	
	<i>Petrochelidon nigricans</i>	Tree Martin	
Laridae	<i>Larus novaehollandiae</i>	Silver Gull	
Maluridae	<i>Malurus cyaneus</i>	Superb Fairy-wren	✓
	<i>Malurus lamberti</i>	Variegated Fairy-wren	
	<i>Stipiturus malachurus</i>	Southern Emu-wren	
Megapodiidae	<i>Alectura lathamii</i>	Australian Brush-turkey	
Meliphagidae	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	
	<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill	✓
	<i>Anthochaera carunculata</i>	Red Wattlebird	✓
	<i>Anthochaera chrysoptera</i>	Little Wattlebird	
	<i>Entomyzon cyanotis</i>	Blue-faced Honeyeater	
	<i>Epthianura albifrons</i>	White-fronted Chat	
	<i>Gliciphila melanops</i>	Tawny-crowned Honeyeater	
	Grantiella picta	Painted Honeyeater (V)	
	<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater	✓
	<i>Lichenostomus fuscus</i>	Fuscous Honeyeater	
	<i>Lichenostomus leucotis</i>	White-eared Honeyeater	✓
	<i>Lichenostomus melanops</i>	Yellow-tufted Honeyeater	
	<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater	
	<i>Manorina melanocephala</i>	Noisy Miner	✓
	<i>Manorina melanophrys</i>	Bell Miner	
	<i>Meliphaga lewinii</i>	Lewin's Honeyeater	
	<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater	
	Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies) (V)	
	<i>Melithreptus lunatus</i>	White-naped Honeyeater	✓
	<i>Myzomela sanguinolenta</i>	Scarlet Honeyeater	
	<i>Philemon citreogularis</i>	Little Friarbird	
	<i>Philemon corniculatus</i>	Noisy Friarbird	✓
	<i>Phylidonyris niger</i>	White-cheeked Honeyeater	
	<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater	✓
	<i>Phylidonyris pyrrhoptera</i>	Crescent Honeyeater	
	<i>Plectorhyncha lanceolata</i>	Striped Honeyeater	
	<i>Anthochaera phrygia</i>	Regent Honeyeater (CE, E*)	
Menuridae	<i>Menura novaehollandiae</i>	Superb Lyrebird	✓
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	
Motacillidae	<i>Anthus australis</i>	Australian Pipit	
Muscicapidae	<i>Turdus merula</i> *	Eurasian Blackbird	
	<i>Zoothera lunulata</i>	Bassian Thrush	
Neosittidae	Daphoenositta chrysoptera	Varied Sittella (V)	
Oriolidae	<i>Oriolus sagittatus</i>	Olive-backed Oriole	
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrike-thrush	✓
	<i>Falcunculus frontatus</i>	Eastern Shrike-tit	
	<i>Pachycephala pectoralis</i>	Golden Whistler	
	<i>Pachycephala rufiventris</i>	Rufous Whistler	✓
Pardalotidae	<i>Pardalotus punctatus</i>	Spotted Pardalote	✓

Family Name	Scientific Name	Common Name	Recorded
	<i>Pardalotus striatus</i>	Striated Pardalote	✓
Passeridae	<i>Passer domesticus</i> *	House Sparrow	
Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian Pelican	
Petroicidae	<i>Eopsaltria australis</i>	Eastern Yellow Robin	✓
	<i>Melanodryas cucullata</i>	Hooded Robin	
	<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form) (V)	
	<i>Microeca fascinans</i>	Jacky Winter	
	<i>Petroica boodang</i>	Scarlet Robin (V)	✓
	<i>Petroica goodenovii</i>	Red-capped Robin	
	<i>Petroica phoenicea</i>	Flame Robin (V)	
	<i>Petroica rosea</i>	Rose Robin	
Phalacrocoracidae	<i>Phalacrocorax carbo</i>	Great Cormorant	
	<i>Phalacrocorax melanoleucus</i>	Little Pied Cormorant	
	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant	
	<i>Phalacrocorax varius</i>	Pied Cormorant	
Phasianidae	<i>Coturnix pectoralis</i>	Stubble Quail	
	<i>Coturnix ypsilophora</i>	Brown Quail	
Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth	
Podicipedidae	<i>Podiceps cristatus</i>	Great Crested Grebe	
	<i>Poliocephalus poliocephalus</i>	Hoary-headed Grebe	
	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe	
Pomatostomidae	<i>Pomatostomus superciliosus</i>	White-browed Babbler	
	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies) (V)	
Psittacidae	<i>Alisterus scapularis</i>	Australian King-Parrot	✓
	<i>Glossopsitta concinna</i>	Musk Lorikeet	
	<i>Glossopsitta pusilla</i>	Little Lorikeet (V)	
	<i>Lathamus discolor</i>	Swift Parrot (E, E*)	
	<i>Neophema pulchella</i>	Turquoise Parrot (V)	
	<i>Platycercus adscitus eximius</i>	Eastern Rosella	
	<i>Platycercus elegans</i>	Crimson Rosella	✓
	<i>Psephotus haematonotus</i>	Red-rumped Parrot	
	<i>Trichoglossus chlorolepidotus</i>	Scaly-breasted Lorikeet	
	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	
Ptilonorhynchidae	<i>Ptilonorhynchus violaceus</i>	Satin Bowerbird	
Pycnonotidae	<i>Pycnonotus jocosus</i> *	Red-whiskered Bulbul	
Rallidae	<i>Fulica atra</i>	Eurasian Coot	
	<i>Gallinula tenebrosa</i>	Dusky Moorhen	
	<i>Gallirallus philippensis</i>	Buff-banded Rail	
	<i>Porphyrio porphyrio</i>	Purple Swampphen	
	<i>Pozana fluminea</i>	Australian Spotted Crake	
	<i>Pozana pusilla</i>	Baillon's Crake	
	<i>Pozana tabuensis</i>	Spotless Crake	
	<i>Rallus pectoralis</i>	Lewin's Rail	
	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper (EM)	
Scolopacidae	<i>Gallinago hardwickii</i>	Latham's Snipe (EM)	
	<i>Ninox boobook</i>	Southern Boobook	
Strigidae	<i>Ninox connivens</i>	Barking Owl (V)	
	<i>Ninox strenua</i>	Powerful Owl (V)	
Sturnidae	<i>Acridotheres tristis</i> *	Common Myna	
	<i>Sturnus vulgaris</i> *	Common Starling	
Sylviidae	<i>Acrocephalus australis</i>	Australian Reed-Warbler	
	<i>Cincloramphus cruralis</i>	Brown Songlark	
	<i>Cincloramphus mathewsi</i>	Rufous Songlark	
	<i>Megalurus gramineus</i>	Little Grassbird	

Family Name	Scientific Name	Common Name	Recorded
Threskiornithidae	<i>Platalea flavipes</i>	Yellow-billed Spoonbill	
	<i>Platalea regia</i>	Royal Spoonbill	
	<i>Threskiornis molucca</i>	Australian White Ibis	
	<i>Threskiornis spinicollis</i>	Straw-necked Ibis	
Turnicidae	<i>Turnix varia</i>	Painted Button-quail	
Tytonidae	<i>Tyto alba</i>	Barn Owl	
	<i>Tyto novaehollandiae</i>	Masked Owl (V)	✓
	<i>Tyto tenebricosa</i>	Sooty Owl (V)	
Zosteropidae	<i>Zosterops lateralis</i>	Silvereye	✓

Known and Expected Mammal List

Appendix Key:

1 = Results of ecological investigations conducted within the Study Area
 ✓ = Species Detected
 * = introduced species
 (E) = listed as Endangered in NSW (TSC Act).
 (V) = listed as Vulnerable in NSW (TSC Act).
 (EV) = Species listed under the Commonwealth EPBC Act as Vulnerable
 (EE) = Species listed under the Commonwealth EPBC Act as Endangered
 Species indicated in **BOLD** font are those threatened species known to occur within Lithgow LGA (Atlas of NSW Wildlife)

Data Source:

✓ = Species recorded during this survey

Family Name	Scientific Name	Common Name	Recorded
Acrobatidae	<i>Acrobates pygmaeus</i>	Feathertail Glider	
Bovidae	<i>Bos taurus</i> *	European Cattle	
	<i>Capra hircus</i> *	Goat	
Burramyidae	<i>Cercartetus nanus</i>	Eastern Pygmy-possum (V)	
Canidae	<i>Canis lupus familiaris</i> *	Dog	
	<i>Canis lupus</i> *	Dingo, domestic dog	
	<i>Vulpes vulpes</i> *	Fox	
Cervidae	<i>Cervus sp.</i> *	Deer	
Dasyuridae	<i>Antechinus agilis</i>	Agile Antechinus	
	<i>Antechinus flavipes</i>	Yellow-footed Antechinus	
	<i>Antechinus stuartii</i>	Brown Antechinus	
	<i>Antechinus swainsonii</i>	Dusky Antechinus	
	<i>Antechinus/Sminthopsis sp.</i>	unidentified 'Marsupial Mouse'	
	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll (V, V*)	
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat (V)	
Equidae	<i>Equus caballus</i> *	Horse	
Felidae	<i>Felis catus</i> *	Cat	
Leporidae	<i>Lepus capensis</i> *	Brown Hare	
	<i>Oryctolagus cuniculus</i> *	Rabbit	
Macropodidae	<i>Macropus giganteus</i>	Eastern Grey Kangaroo	✓
	<i>Macropus robustus</i>	Common Wallaroo	
	<i>Macropus rufogriseus</i>	Red-necked Wallaby	✓
	<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby (E, V*)	
	<i>Wallabia bicolor</i>	Swamp Wallaby	✓
Molossidae	<i>Mormopterus</i> "Species 2"	Undescribed Freetail Bat	
	<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat (V)	
	<i>Mormopterus planiceps</i>	Little Mastiff-bat	
	<i>Mormopterus sp.</i>	Mastiff-bat	
	<i>Austronomus australis</i>	White-striped Freetail-bat	
Muridae	<i>Hydromys chrysogaster</i>	Water-rat	
	<i>Mus musculus</i> *	House Mouse	
	<i>Rattus fuscipes</i>	Bush Rat	
	<i>Rattus lutreolus</i>	Swamp Rat	
	<i>Rattus rattus</i> *	Black Rat	
Ornithorhynchidae	<i>Ornithorhynchus anatinus</i>	Platypus	

Family Name	Scientific Name	Common Name	Recorded
Peramelidae	<i>Isodon/Perameles sp.</i>	unidentified Bandicoot	
Petauridae	<i>Petaurus australis</i>	Yellow-bellied Glider (V)	
	<i>Petaurus breviceps</i>	Sugar Glider	
	<i>Petaurus norfolcensis</i>	Squirrel Glider (V)	
Phalangeridae	<i>Trichosurus caninus</i>	Short-eared Possum	
	<i>Trichosurus sp.</i>	Brushtail Possum	
	<i>Trichosurus vulpecula</i>	Common Brushtail Possum	
Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala (V)	
Potoroidae	<i>Bettongia gaimardi</i>	Tasmanian Bettong	
Pseudocheiridae	<i>Petauroides volans</i>	Greater Glider	
	<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum	✓
Rhinolophidae	<i>Rhinolophus megaphyllus</i>	Eastern Horseshoe-bat	
Suidae	<i>Sus scrofa*</i>	Pig	
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	
Vespertilionidae	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat (V, V*)	
	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat	
	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle (V)	
	<i>Miniopterus australis</i>	Little Bentwing-bat (V)	
	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat (V)	
	<i>Myotis adversus</i>	Large-footed Myotis (V)	
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	
	<i>Nyctophilus gouldi</i>	Gould's Long-eared Bat	
	<i>Nyctophilus sp.</i>	Long-eared bat	
	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat (V)	
	<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat	
	<i>Scotorepens orion</i>	Eastern Broad-nosed Bat	
	<i>Vespadelus darlingtoni</i>	Large Forest Bat	
	<i>Vespadelus pumilus</i>	Eastern Forest Bat	
	<i>Vespadelus regulus</i>	Southern Forest Bat	
	<i>Vespadelus vulturnus</i>	Little Forest Bat	
Vombatidae	<i>Vombatus ursinus</i>	Common Wombat	

Known and Expected Reptile List

Appendix Key:

1 = Results of ecological investigations conducted within the Study Area

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(EV) = Species listed under the Commonwealth EPBC Act as Vulnerable

(EE) = Species listed under the Commonwealth EPBC Act as Endangered

(EMa) = Species listed under the Commonwealth EPBC Act as Marine
Species indicated in **BOLD** font are those threatened species known to occur

within Lithgow LGA (Atlas of NSW Wildlife)

Data Source:

✓ = Species recorded during this survey

Family Name	Scientific Name	Common Name	Recorded
Agamidae	<i>Amphibolurus muricatus</i>	Jacky Lizard	✓
	<i>Amphibolurus nobbi</i>	Nobbi	
	<i>Physignathus lesueurii</i>	Eastern Water Dragon	
	<i>Pogona barbata</i>	Bearded Dragon	
	<i>Rankinia diemensis</i>	Mountain Dragon	
Chelidae	<i>Chelodina longicollis</i>	Eastern Snake-necked Turtle	
	<i>Acanthophis antarcticus</i>	Death Adder	✓
Elapidae	<i>Austrelaps ramsayi</i>	Highland Copperhead	
	<i>Austrelaps superbus</i>	Lowland Copperhead	
	<i>Cryptophis nigrescens</i>	Eastern Small-eyed Snake	
	<i>Drysdalia rhodogaster</i>	Mustard-bellied Snake	
	<i>Furina diadema</i>	Red-naped Snake	
	<i>Hoplocephalus bungaroides</i>	Broad-headed Snake (E, V*)	
	<i>Notechis scutatus</i>	Tiger Snake	
	<i>Parasuta dwyeri</i>	Dwyer's Snake	
	<i>Parasuta spectabilis</i>	Mallee Black-headed Snake	
	<i>Pseudechis guttatus</i>	Spotted Black Snake	
	<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake	
	<i>Pseudonaja textilis</i>	Eastern Brown Snake	✓
	<i>Vermicella annulata</i>	Bandy-bandy	
Gekkonidae	<i>Diplodactylus vittatus</i>	Wood Gecko	
	<i>Oedura lesueurii</i>	Lesueur's Velvet Gecko	
	<i>Phyllurus platurus</i>	Broad-tailed Gecko	
	<i>Underwoodisaurus milii</i>	Thick-tailed Gecko	
Pygopodidae	<i>Pygopus lepidopodus</i>	Common Scaly-foot	
Scincidae	<i>Acritoscincus duperreyi</i>	Eastern Three-lined Skink	
	<i>Acritoscincus platynota</i>	Red-throated Skink	
	<i>Carlia tetradactyla</i>	Southern Rainbow-skink	
	<i>Cryptoblepharus virgatus</i>	Cream-striped Shinning-skink	
	<i>Ctenotus robustus</i>	Robust Ctenotus	
	<i>Ctenotus taeniolatus</i>	Copper-tailed Skink	✓
	<i>Egernia cunninghami</i>	Cunningham's Skink	
	<i>Egernia saxatilis</i>	Black Rock Skink	
	<i>Egernia saxatilis intermedia</i>		
	<i>Egernia striolata</i>	Tree Skink	
	<i>Egernia whitii</i>	White's Skink	
	<i>Eulamprus heatwolei</i>	Yellow-bellied Water-skink	
	<i>Eulamprus leuraensis</i>	Blue Mountains Water skink (E, E*)	

Family Name	Scientific Name	Common Name	Recorded
	<i>Eulamprus quoyii</i>	Eastern Water-skink	✓
	<i>Eulamprus tenuis</i>	Barred-sided Skink	
	<i>Eulamprus tympanum</i>	Southern Water-skink	
	<i>Hemiergis decresiensis</i>	Three-toed Earless Skink	
	<i>Lampropholis delicata</i>	Dark-flecked Garden Sunskink	✓
	<i>Lampropholis guichenoti</i>	Pale-flecked Garden Sunskink	
	<i>Lampropholis</i> sp.	unidentified grass skink	
	<i>Lerista bougainvillii</i>	South-eastern Slider	
	<i>Lygisaurus foliorum</i>	Tree-base Litter-skink	
	<i>Morethia boulengeri</i>	South-eastern Morethia Skink	
	<i>Pseudemoia entrecasteauxii</i>	Tussock Cool-skink	
	<i>Pseudemoia pagenstecheri</i>	Tussock Skink	
	<i>Saiphos equalis</i>	Three-toed Skink	
	<i>Saproscincus mustelinus</i>	Weasel Skink	
	<i>Tiliqua nigrolutea</i>	Blotched Blue-tongue	
	<i>Tiliqua scincoides</i>	Eastern Blue-tongue	
Typhlopidae	<i>Ramphotyphlops nigrescens</i>	Blackish Blind Snake	
Varanidae	<i>Varanus rosenbergi</i>	Rosenberg's Goanna (V)	
	<i>Varanus</i> sp.	Unidentified Goanna	
	<i>Varanus varius</i>	Lace Monitor	

Known and Expected Frog List

Appendix Key:

1 = Results of ecological investigations conducted within the Study Area

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(EV) = Species listed under the Commonwealth EPBC Act as Vulnerable

(EE) = Species listed under the Commonwealth EPBC Act as Endangered

Species indicated in **BOLD** font are those threatened species known to occur

within Lithgow LGA (Atlas of NSW Wildlife)

Data Source:

✓ = Species recorded during this survey

Family Name	Scientific Name	Common Name	Recorded
Hylidae	Litoria booroolongensis	Booroolong Frog (E, E*)	
	<i>Litoria caerulea</i>	Green Tree Frog	
	<i>Litoria citropa</i>	Blue Mountains Tree Frog	
	<i>Litoria dentata</i>	Bleating Tree Frog	
	<i>Litoria ewingii</i>	Brown Tree Frog	
	<i>Litoria fallax</i>	Eastern Dwarf Tree Frog	
	<i>Litoria latopalmata</i>	Broad-palmed Frog	
	<i>Litoria lesueuri</i>	Lesueur's Frog	
	<i>Litoria peronii</i>	Peron's Tree Frog	
	<i>Litoria phyllochroa</i>	Leaf-green Tree Frog	
	<i>Litoria sp.</i>	Unidentified Tree Frog	
	<i>Litoria verreauxii</i>	Verreaux's Frog	
	<i>Litoria wilcoxii</i>		
Myobatrachidae	<i>Crinia parinsignifera</i>	Eastern Sign-bearing Froglet	
	<i>Crinia signifera</i>	Common Eastern Froglet	
	Heleioporus australiacus	Giant Burrowing Frog (V, V*)	
	<i>Limnodynastes dumerilii</i>	Eastern Banjo Frog	
	<i>Limnodynastes fletcheri</i>	Long-thumbbed Frog	
	<i>Limnodynastes ornatus</i>	Ornate Burrowing Frog	
	<i>Limnodynastes peronii</i>	Striped Marsh Frog	
	<i>Limnodynastes tasmaniensis</i>	Spotted Grass Frog	
	Mixophyes balbus	Stuttering Frog (E, V*)	
	<i>Neobatrachus sudelli</i>	Sudell's Frog	
	Pseudophryne australis	Red-crowned Toadlet (V)	
	<i>Pseudophryne bibronii</i>	Bibron's Toadlet	
	<i>Pseudophryne sp.</i>		
	<i>Uperoleia laevigata</i>	Smooth Toadlet	

Appendix 2

Flora Species List

Flora Species List

Family	Scientific Name	Common Name
TREES		
Myrtaceae	<i>Eucalyptus blaxlandii</i>	Blaxland's Stringybark
	<i>Eucalyptus dalrympleana</i>	Mountain Gum
	<i>Eucalyptus dives</i>	Broad-leaved Peppermint
	<i>Eucalyptus oreades</i>	Blue Mountains Ash
	<i>Eucalyptus piperita</i>	Sydney Peppermint
	<i>Eucalyptus radiata</i>	Narrow-leaved Peppermint
	<i>Eucalyptus sclerophylla</i>	Scribbly Gum
	<i>Eucalyptus sieberi</i>	Silvertop Ash
SHRUBS		
Apiaceae	<i>Platysace linearifolia</i>	Narrow-leaved Platysace
Araliaceae	<i>Polyscias sambucifolia</i>	Elderberry Panax
	<i>Cassinia cunninghamii</i>	Cunningham's Everlasting
Epacridaceae	<i>Brachyloma daphnoides</i>	Daphne Heath
	<i>Epacris microphylla</i>	Coral Heath
	<i>Epacris pulchella</i>	Wallum Heath
	<i>Leucopogon lanceolatus</i>	Lance-leaf Beard-heath
	<i>Monotoca scoparia</i>	Prickly Broom-heath
Euphorbiaceae	<i>Amperea xiphoclada</i> var. <i>xiphoclada</i>	Broom Spurge
Fabaceae	<i>Daviesia latifolia</i>	-
	<i>Daviesia squarrosa</i>	-
	<i>Gompholobium huegelii</i>	Pale Wedge Pea
	<i>Phyllota squarrosa</i>	Dense Phyllota
	<i>Acacia buxifolia</i>	Box-leaf Wattle
	<i>Acacia terminalis</i>	Sunshine Wattle
Myrtaceae	<i>Baeckea linifolia</i>	Weeping Baeckea
	<i>Leptospermum arachnoides</i>	-
	<i>Leptospermum grandifolium</i>	Woolly Tea-tree
	<i>Leptospermum obovatum</i>	-
	<i>Leptospermum polygalifolium</i> subsp. <i>polygalifolium</i>	Tantoon
	<i>Leptospermum trinervium</i>	Slender Tea-tree
Proteaceae	<i>Banksia spinulosa</i>	Hairpin Banksia
	<i>Banksia marginata</i>	Silver Banksia
	<i>Grevillea laurifolia</i>	Laurel-leaf Grevillea
	<i>Hakea dactyloides</i>	Broad-leaved Hakea
	<i>Hakea sericea</i>	Needlebush
	<i>Isopogon anemonifolius</i>	Flat-leaved Drumsticks
	<i>Lomatia silaifolia</i>	Crinkle Bush
	<i>Persoonia chamaepitys</i>	Mountain Geebung
	<i>Persoonia hindii</i> (E)	-
	<i>Persoonia oblongata</i>	-

Family	Scientific Name	Common Name
	<i>Petrophile pulchella</i>	Conesticks
	<i>Petrophile sessilis</i>	Conesticks
Rhamnaceae	<i>Pomaderris andromedifolia</i>	-
Rutaceae	<i>Boronia microphylla</i>	Small-leaved Boronia
Santalaceae	<i>Leptomeria acida</i>	Native Currant
Santalaceae	<i>Omphacomeria acerba</i>	-
GROUNDCOVERS		
Cyperaceae	<i>Gahnia aspera</i>	Saw Sedge
	<i>Gahnia sieberiana</i>	Red-fruited Saw-sedge
	<i>Lepidosperma laterale</i>	Variable Sword-sedge
	<i>Lepidosperma limicola</i>	-
Dennstaedtiaceae	<i>Pteridium esculentum</i>	Bracken
Dilleniaceae	<i>Hibbertia obtusifolia</i>	Grey Guinea Flower
Droseraceae	<i>Drosera peltata</i>	Sundew
Droseraceae	<i>Drosera spathulata</i>	Common Sundew
Euphorbiaceae	<i>Poranthera microphylla</i>	-
Gentianaceae	<i>Centaurium erythraea</i> *	Common Centaury
Gleicheniaceae	<i>Gleichenia dicarpa</i>	Pouched Coral Fern
Goodeniaceae	<i>Dampiera stricta</i>	Blue Dampiera
	<i>Goodenia bellidifolia</i>	Daisy-leaved Goodenia
Goodeniaceae	<i>Goodenia hederacea</i> subsp. <i>hederacea</i>	Ivy-leaved Goodenia
Haloragaceae	<i>Gonocarpus tetragynus</i>	Poverty Raspwort
	<i>Gonocarpus teuroides</i>	Raspwort
Iridaceae	<i>Patersonia glabrata</i>	Leafy Purple-flag
	<i>Patersonia sericea</i>	Wild Iris
Lomandraceae	<i>Lomandra filiformis</i> subsp. <i>coriacea</i>	Wattle Mat-rush
	<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	Wattle Mat-rush
	<i>Lomandra glauca</i>	Pale Mat-rush
	<i>Lomandra longifolia</i>	Spiky-headed Mat-rush
	<i>Lomandra multiflora</i>	Many-flowered Mat-rush
Orchidaceae	<i>Dipodium punctatum</i>	Hyacinth Orchid
Oxalidaceae	<i>Oxalis perrenans</i>	Yellow-flowered Wood Sorrel
	<i>Dianella revoluta</i> var. <i>revoluta</i>	Spreading Flax Lily
Poaceae	<i>Austrodanthonia racemosa</i> var. <i>racemosa</i>	Wallaby Grass
	<i>Austrostipa pubescens</i>	Tall Speargrass
	<i>Joycea pallida</i>	Silvertop Wallaby Grass
	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Rice Grass
	<i>Poa seiberiana</i> var. <i>cyanophylla</i>	-
Proteaceae	<i>Grevillea laurifolia</i>	Laurel-leaf Grevillea
Restionaceae	<i>Baloskion australe</i>	-
	<i>Empodisma minus</i>	-
Stylidiaceae	<i>Stylidium graminifolium</i>	Grass Trigger Plant
	<i>Stylidium lineare</i>	Narrow-leaved Trigger Plant
Thymelaeaceae	<i>Pimelea linifolia</i> subsp. <i>linifolia</i>	Slender Rice Flower
	<i>Tetratheca rupicola</i>	Black-eyed Susan

Family	Scientific Name	Common Name
	<i>Viola betonicifolia</i>	Native Violet
	<i>Viola hederacea</i>	Ivy-leaved Violet
Xanthorrhoeaceae	<i>Xanthorrhoea resinosa</i>	-
CLIMBERS		
Pittosporaceae	<i>Billardiera scandens</i>	Hairy Appleberry

Appendix 3

Personnel involved in the Project and their Qualifications



Curriculum Vitae

TOBY LAMBERT

Principal Ecologist

Newcastle, NSW

Bachelor of Environmental Science, University of Newcastle, 1993 - 1996

Accredited BioBanking Assessor, Tafe NSW – Ryde, 2009

NSW Driver's Licence (Class C)

OH&S Induction Training (Green Card)

NPWS Scientific Investigation Licence and NSW Animal Ethics Research Authority

AREAS OF EXPERTISE:

Toby has over fifteen years experience in undertaking and managing a diverse array of ecological and environmental surveys and assessments. As a Principal Ecologist, he supervises all facets of flora and fauna assessment and related reports: planning, supervision of field and reporting staff, project scheduling, budget management, liaising with clients and Government departments and providing advice of all kinds. He has also been called upon to prepare expert evidence for matters at the NSW Land and Environment Court. Toby has produced ecological and environmental documentation for private and public projects ranging in complexity. These include a number of wind farms throughout Australia and New Zealand, coal mines and a range of infrastructure projects within the Hunter region. Toby has also managed ecological master planning for residential projects in Sydney, the Central Coast and the Hunter. Toby's fields of expertise are Environmental Impact Assessment and mediation, flora, fauna and habitat survey method, design and identification, detailed understanding of legislation and threatened species issues, terrestrial fauna surveys and project management. He has experience in conducting comprehensive fauna surveys and preparing related documentation in a broad array of environments throughout New South Wales, with most projects located in the greater Sydney area, Mid-West, Blue Mountains, Central Coast, Hunter and Forster / Great Lakes regions. Toby has also undertaken ecological projects in Western Australia, Queensland, the ACT and New Zealand.

SELECTED PROJECT EXPERIENCE:

Ecology

- **Centennial Coal** - Environmental Project Manager for consultancy works to Centennial Coal covering a broad range of disciplines, but primarily focussed on ecological impact assessments, monitoring and management at numerous coal mines in the Mid-West, western Blue Mountains and Lake Macquarie NSW.
- **Peabody Energy Australia** - Senior Project Manager for project specific and ongoing monitoring requirements for Wambo Coal Mine at Warkworth in the Upper Hunter Valley, Toby liaises directly with the Environmental Manager of the mine in relation to requirements to fulfil consent conditions for the ongoing development and operation of the project.
- **Allco Wind Energy** - This involved undertaking fauna surveys for a 100 turbine wind farm on the North Island of New Zealand and coordinating other ecological specialists to prepare an ecological impact assessment for submission to Taranaki Council. Aspects included regular liaison with the Department of Conservation regarding issues of significance, survey methodology, and mitigation and management measures to protect significant ecological features. Local bird groups were also involved and Toby was involved in the public consultation sessions.
- **Stockland Wallarah Peninsula** - This Lake Macquarie, NSW project required a multi-disciplinary approach to an innovative residential proposal on environmentally sensitive land. Project management of, and participation in, a large and diverse planning team were major features of this work. Toby was a pivotal member of the



Curriculum Vitae

- CONTINUED -

project management team that provided the detailed ecological input and advice that was required from the early stages of the planning process to the point of submission to determining authorities. The proposal required sophisticated and creative impact assessment and reporting. Toby made a major contribution to the production of a series of comprehensive ecological reports that ensured the ecological integrity of the site was maintained in the post-development landscape.

- **Hunter Economic Zone Industrial Estate** - Project Manager for the environmental component of the development of the Hunter Economic Zone industrial estate at Kurri Kurri, to be the largest industrial estate in NSW.

PREVIOUS EXPERIENCE:

Senior Project Manager - Cumberland Ecology, Epping **2005**

Duties included flora and fauna surveying and survey design; overseeing and contribution to the preparation of complex ecological and environmental reports for both small and large projects; flora and fauna surveying and survey design; liaison with both the private sector and federal, state and local government departments.

Principal Consultant / Co-Founder - Keystone Ecological, Kariong **2004 - 2005**

Preparation and development of Keystone Ecological Flora and Fauna Impact Assessment report format; development of client database, including organisation of promotional material, logo design and customer relations; administration including preparation of quotes and invoices and organising accounts and BAS statements; Flora and fauna surveying and survey design; along with Anabat II Data Analysis.

Project Manager - Ecology - Conacher Travers Environmental, Somersby **1998 - 2004**

Supervision of flora and fauna survey design; report quality control; production of technical reports such as Review of Environmental Factors, Flora & Fauna Assessments, Statement of Environmental Effects, Species Impact Statements and Plans of Management, Land and Environment Court Evidence preparation, EPBC Act Referrals and Preliminary Information preparation; Flora & fauna surveying; liaison with Department of Environment and Conservation, Department of Environment and Heritage, Department of Infrastructure, Planning and Natural Resources, Department of Agriculture, Local Governments and private clients; Anabat II Data Analysis; Water Testing; Data Recording and Statistical Analysis.

Volunteer for Green and Golden Bell Frog Survey - Australian Museum, North Avoca **1999 - 2001**

Survey and searches for the endangered species Green & Golden Bell Frog; assisting in weighing, measuring and micro-chipping frogs for on-going research purposes.

Environmental Scientist - Australian Defence Industries (ADI), St Marys **1998**

Bore Water Sampling; statistical analysis of test results; and report production.

Environmental Scientist - Anne Clements & Associates, North Sydney **1997**

Field Assistant to Botanist and data recording.

Research Assistant - University of Newcastle **1996**

Initiation of design of final year project for Biology Dept; research into fire regimes on species composition & regeneration in open woodland; use of advanced scientific equipment including infra red gas analyser in the field, and replication of experiments using computer database; theoretical knowledge on soils, nutrient cycles & vegetation types.

MEMBERSHIPS & ACHIEVEMENTS:

- Ecological Consultants Association of NSW (ECA) – Council Member
- Newcastle Green Drinks for Environmental Professionals organising committee



Curriculum Vitae

PAUL HILLIER

Senior Ecologist

Newcastle, NSW

Bachelor of Environmental Science (Environmental Management)

NSW Driver's Licence (Class C)

OH&S Induction Training (White Card)

Senior First Aid

Dive Master (PADI Scuba Diver)

AREAS OF EXPERTISE:

Paul has broad range of Ecological Assessment reporting experience from 8 years of professional ecological work both in Australia and abroad. Project experience has primarily included a range of flora and fauna assessment disciplines as required by a wide range of corporate and domestic client requirements. Paul has been employed both within the private and public sector, providing a strong knowledge and understanding of the role of both developers and government in legislation and planning.

Paul has the majority of his experience within the consultancy industry, primarily focussing on the preparation of Flora and Fauna Assessments, Environmental Assessments, Environmental Impact Statements, Review of Environmental Factors and Statement of Environmental Effects. Paul has experience with targeted threatened flora and fauna surveys, including a strong knowledge of Geographic Information Systems mapping and analyses.

SELECTED PROJECT EXPERIENCE:

Ecology

- Ecological Constraints Master Plan – Huntlee, Singleton and Cessnock, NSW (2007-2010)
- Ecosystem Function Analysis – Wambo Coal, Singleton NSW (2010).
- Ecological Assessment Report – White Rock Wind Farm, Glen Innes, NSW (2011).

PREVIOUS EXPERIENCE:

Ecological Records Officer – West Yorkshire Ecology (2007-2009)
Duties included collection and collation of ecological records from across West Yorkshire, United Kingdom; Preparation of fee proposals for ecological services; GIS/ spatial analysis and database management; Database searches and reporting; Liaison with client, stakeholder groups, state and local governing bodies; Review of local planning applications and consequent consultations to local councils.

Ecologist – Harper Somers O'Sullivan (2004-2006)
Duties included flora and fauna surveying and survey design; overseeing and contribution to the preparation of complex ecological and environmental reports for both small and large projects; liaison with both the private sector and federal, state and local government department.

MEMBERSHIPS & ACHIEVEMENTS:

- For Australian Wildlife Needing Aid (FAWNA), NSW Australia



Curriculum Vitae

ARNE BISHOP

Field Ecologist

Newcastle, NSW

Bachelor of Environmental Science/Landscape Architecture, University of Canberra, 2009

Cert IV Horticulture (Landscape) Canberra Institute of Technology, 2003

Cert III Horticulture (Landscape), Canberra Institute of Technology, 2002

Cert II Australian Land Conservation and Restoration, Conservation Volunteers Australia, 2001

NSW Driver's Licence (Class C)

AREAS OF EXPERTISE:

Arne began paid employment in environmental management as a part time field assistant for Alison Rowell Environmental Consultancy in 1999. This role included working on flora and fauna surveys, and habitat/vegetation assessment and mapping. The knowledge and experience Arne gained from this role progressed and developed into a sub-consultancy role with full time employment over spring- summer every year.

In 2001 Arne completed a six month environmental traineeship with Green Corps. This course involved learning about environmental issues and how best to manage them in a practical sense. Arne performed duties such as: pest and weed identification and control; bush regeneration; and natural area restoration.

In addition to the above, Arne has also completed several contracts as an environmental consultant for Eco Logical Australia, assisting with threatened species identification and monitoring on a range of projects. All of these roles have been focused on collating and interpreting scientific information in order to produce recommendations on and resolutions to environmental issues.

SELECTED PROJECT EXPERIENCE:

- Flora and fauna identification and habitat assessment
- Targeted threatened flora and fauna surveys
- Delineation and mapping of vegetation communities
- Endangered Ecological Community (EEC) assessment
- Experience with GPS/GIS for project design and mapping
- Conducting Field Surveys for Flora, Fauna and Habitat Identification
- Report Preparation including Fauna and Flora Assessments
- Ecological Monitoring and Reporting
- Vegetation Management Plan Reporting
- Understanding of environmental legislation

PREVIOUS EXPERIENCE:

Ecologist – RPS Australia East Pty Ltd.

2011 - Current

This role included working on flora and fauna surveys, and habitat/vegetation assessment and mapping.

Part-time field assistant/consultant – Alison Rowell

1999 - 2010

This role included working on flora and fauna surveys, and habitat/vegetation assessment and mapping. The knowledge and experience I have gained from this role has progressed and developed into a sub-consultancy role with full time employment over spring- summer every year.



Curriculum Vitae

- CONTINUED -

Environmental consultancy work - Eco Logical Australia

2008 - 10

Arne completed several contracts as an environmental consultant for Eco Logical Australia, assisting with threatened species identification and monitoring on a range of projects.

Green Corps Traineeship - Conservation Volunteers Australian (CVA)

2001

Arne received accredited practical and theoretical training in; First Aid (Level 2, St Johns); Occupational Health and Safety and Environmental Concepts. This training contributed to Certificate II in Australian Land Conservation and Restoration.

MEMBERSHIPS & ACHIEVEMENTS:

- Award of Excellence for first place in Conservation Biology and Genetics – University of Canberra.
- Landscape Functional Analysis Training
- First Aid Certification (expires 25/01/2015)
- Four Wheel Drive Training
- Royal Zoological Society NSW membership
- Ecological Consultants Association membership
- Birds Australia membership
- Frog & Tadpole Study Group NSW membership

CHRIS MCLEAN**Ecologist**

Bachelor of Environmental Science, majoring in Environmental Management, University of Newcastle 2007

Bachelor of Environmental Science (Honours Class I, F), University of Newcastle 2008

Doctor of Philosophy 2009-current, University of Wollongong, Thesis topic: Effect of fire regimes and logging on tree hollows, arboreal marsupials and owls in Eucalypt forests. To be completed end of 2011

Conservation and Land Management Certificate II, OTEN TAFE, 2004

Tourism (Guiding) Certificate III, Northern Beaches Institute TAFE, 2009

Advanced Four Wheel Drive operation course

Senior First Aid

AREAS OF EXPERTISE:

Chris has 10 years experience in natural resource management, community engagement and environmental education, developed through working as a natural resource project coordinator at Lake Macquarie Landcare and as a Discovery Ranger and Volunteer Coordinator the NSW National Parks and Wildlife Service. Chris has five years experience in ecological survey, sampling and experimental design. He has extensive experience in the survey of nocturnal fauna, in particular arboreal marsupials and forest owls. This experience has been developed through his PhD studies on the effect of fire and logging on hollow trees and hollow dependent fauna in north-eastern New South Wales. Chris has extensive experience in conducting landscape scale experiments and in the use of multivariate statistical data analysis methods.

SELECTED PROJECT EXPERIENCE:

- **Investigation of the seasonal effect of fire on small mammal communities in heathland** – report to the NSW National Parks and Wildlife Service 2006
- **Investigation of the correlation between mammalian hair and soil heavy metal concentration** – Honours thesis, 2008.
- **Management of PhD research at the University of Wollongong** – coordination of field logistics, data management, chapter writing and presentations to a range of audiences.

SELECTED PREVIOUS EXPERIENCE:**PhD candidate, Centre for the Environmental Risk Management of Bushfires, University of Wollongong 2008-current**

Involved the design of a landscape scale experiment to investigate the effect and interaction between logging intensity and fire frequency on hollow bearing tree and arboreal marsupial abundance within wet and dry sclerophyll forest in northeastern New South Wales. This research produced a comprehensive dataset that was analysed using contemporary multivariate methods including Generalised Linear Modelling and Regression Trees.

Volunteer Coordinator, NSW National Parks and Wildlife Service February 2008-August 2009

Involved developing work plans with existing volunteer bushland regeneration groups working within Endangered Ecological Communities throughout the Hunter Region. Weed populations were also mapped using GPS and GIS technology.

Landcare in Schools Coordinator, Lake Macquarie Landcare Network February 2006-February 2008

Involved developing school based natural resource management projects in 50 schools throughout the Lake Macquarie Region. Work involved contract administration of ordered materials and ensuring the project ran to budget.



Curriculum Vitae

- CONTINUED -

Discovery Ranger, NSW National Parks and Wildlife Service 2003-current

Role consists of developing environmental interpretive tours throughout the Hunter and Central Coast region. Examples of tours include four wheel drive tag along tours, spotlighting and day walks.

MEMBERSHIPS & ACHIEVEMENTS:

- Bayer-UNEP Ecominds Delegate 2009 – participation in a forum in New Zealand on Sustainable Energy Supply solutions



Curriculum Vitae

JOEL STIBBARD

Field Ecologist

Newcastle, New South Wales

Masters of Environmental Management, University of Queensland, 2009 - Present

Bachelor of Science, University of Queensland, 2001 - 2004

AREAS OF EXPERTISE:

I have had over 5 years of ecological experience around the world in both aquatic and terrestrial environments. I have spent the last 12 months working as an ecologist in Queensland, focussing on botany, vegetation mapping and environmental legislation.

SELECTED PROJECT EXPERIENCE:

Resource Sector

Northern Energy Corporation: Elimatta Project – This project is located 30km west of Wandoan in Queensland and is the site of a large resource of thermal coal. I was involved in the ecological surveys, GIS work and flora and fauna assessment reporting of this project as part of the Environmental Impact Assessment process.

Hancock Coal Pty Ltd: Alpha Coal Project – The site of a well known thermal coal deposit in the Galilee Basin of Queensland, I was involved in terrestrial and aquatic flora and fauna surveys, habitat assessments and reporting.

Hancock Coal Pty Ltd: Kevins Corner Project – Situated to the north of the Alpha Coal Project, I was involved in flora and fauna surveys as well as ecological assessment reporting.

Perilya – Mount Oxide – A copper mine is to be developed on this site; 140km northwest of Mount Isa in Queensland. I was part of a four-man ecology team employed to investigate local flora and fauna as part of the Environmental Impact Assessment process

Ecological Sector

Kalahari Meerkat Project – This project was collaboratively run by the University of Cambridge in the UK and the University of Zurich in Switzerland. I was an ecological researcher on this project in the Northern Cape of South Africa for 1.5 years, assessing the behavioural and reproductive ecology of the Meerkat *Suricata suricatta*.

Great Barrier Reef Monitoring Program – I was a Project Officer for Reef Check Australia in Townsville throughout 2009. I was primarily responsible for organising and implementing monitoring surveys, data collection and reporting to the Great Barrier Reef Marine Park Authority on the health of reefs across the entire GBR.

Meso-American Barrier Reef Monitoring Program – I was a volunteer surveyor for Global Vision International in the Yucatan Peninsula of Mexico during 2008, primarily involved in dive surveys, data collection and ecotourism as a part of a long-term monitoring program.



Curriculum Vitae

- CONTINUED -

PREVIOUS EXPERIENCE:

Ecologist – Australasian Resource Consultants

1 year

I was employed at AARC as an ecologist at the beginning of 2011. My role primarily involved ecological field surveys, EIA reporting and GIS mapping within a consultancy role that required initiative, efficiency and innovation. A valued member of the team, I left AARC to pursue a similar role with RPS in my hometown of Newcastle.

Lab Technician – Fisheries Resource Consultants

0.5 years

My role in the laboratory for FRC in 2010 involved the sorting and identification of macro-invertebrates as an indication of aquatic waterway health. This was a casual position that ended upon gaining employment full-time at AARC.

Ecologist – Environmental, Ground & Water Consultants

0.5 years

I was employed at EGC whilst completing my Masters at the University of Queensland in 2010. This was a project-based role on Curtis Island off of Gladstone in Central Queensland. My role involved ecological surveys, identification of fauna habitat and assessment reporting prior to the development of the QCG LNG plant on Curtis Island.

MEMBERSHIPS & ACHIEVEMENTS:

Deans' Commendation for High Achievement – University of Queensland (2009 -2010)

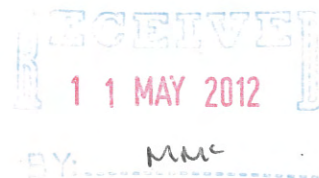
Appendix 4

Flora Species Identification Letter



The Royal
BOTANIC GARDENS
& Domain Trust

National Herbarium of New South Wales



Mr Arne BISHOP
RPS Australia Asia Pacific P/L
PO Box 428
(241 Denison St
Hamilton, NSW 2303
AUSTRALIA

Enquiry No: 17288
Botanical.Is@rbgsyd.nsw.gov.au
Fax No: (02) 9251 1952
Ph No: (02) 9231 8111
Date: 7 May 2012

Dear Mr BISHOP,

Thank you for your enquiry of 20-Apr-12. We are happy to provide the following information:

I have identified your plant specimen as *Galium leiocarpum* syn. *G. propinquum*. No doubt you were confused by the "hooked hairs" description to be found in the Flora. The hairs on this specimen are merely curved! New descriptions and better illustrations of these characters will appear on line soon.

An invoice for \$44.00 (incl. GST) will be forwarded to you separately by our finance section to cover cost of identification.

Please send us the ABN for your company so we can process your invoice.

Thank you for your enquiry.

Yours sincerely

Barbara Wiecek
Identification Botanist
Botanical Information Service



Go to our online Botanical Information Services at
plantnet.rbgsyd.nsw.gov.au to find out more about
plants of New South Wales



Office of
Environment
& Heritage

The Botanical Information Email address is Botanical.Is@rbgsyd.nsw.gov.au
Mrs Macquaries Road Sydney NSW 2000 Australia • Telephone (02) 9231 8111 • Fax (02) 9251 1952