Ecological Assessment

Lidsdale Siding Upgrade Project

Prepared by:

RPS

PO Box 428
Hamilton NSW 2303

T: +61 2 4940 4200
F: +61 2 4961 6794
E: newcastle@rpsgroup.com.au
W: rpsgroup.com.au

Prepared for:

Centennial Ivanhoe Pty Ltd

Lidsdale Siding
Wallerawang NSW 2790

Report No: 105704
Version/Date: Final, May 2012

Document Status

Version	Purpose of Document	Orig	Review	Review Date	Format Review	Approval	Issue Date
Draft 1	Client Review	LV	PH	23-02-12			23-02-12
Draft 2	Client Review	LV	PH	13-03-12			14-03-12
Final	Final for Submission	LV	PH	03-05-12	VD 07-03-12	MD	08-03-12

Disclaimers

Executive Summary

RPS was commissioned by Lidsdale Siding, a subsidiary of Centennial Coal (Western Operations) and managed by Ivanhoe Coal Pty Ltd, to undertake an Ecological Assessment for the proposed upgrade to the existing Lidsdale Siding rail loading facility (automation of the train loading facility). This project comes under Part 3A Section 75F Major Projects of the NSW Environmental Planning and Assessment Act (1979) (EP& A 1979). This Ecological Assessment report will ultimately form part of the Environmental Assessment (EA) for the project.

This assessment aims to examine the likelihood of the proposal to have a significant effect on any threatened species, populations or ecological communities listed under the *Threatened Species Conservation Act 1995* (TSC Act 1995) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999). 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*.

This project involves upgrading the main infrastructure for the Lidsdale Siding rail loading facility including a new stockpile with an automatic stacking, reclaiming and train loading system. The proposed upgrade has been designed based on minimum impact to significant surface features. The proposal may potentially require up to 0.25 ha of native vegetation to be cleared in order to provide infrastructure associated with the upgrade, however giiven the positioning and design of the upgrate, the actual area to be cleatred is likley to be considerably less.

One threatened flora species, one threatened bat species, one threatened bird species and one Endangered Ecological Community (EEC) was recorded within the study area during the surveys undertaken between 2010 and 2012, although habitat is considered suitable for a number of other threatened fauna, which may use the site on at least an intermittent basis.

After due consideration against the relevant key thresholds assessment criteria as set out within Draft Guidelines for Threatened Species Assessment for Part 3A Applications (DEC / DPI 2005), the proposal is not expected to have a significant impact on the ecology of the study area, including threatened flora, threatened fauna or endangered ecological communities that are known or expected to occur therein. The low potential for impact is due to the habitats of the project area being heavily disturbed, providing limited opportunities for those threatened species considered as having potential to occur within the wider study area.

The following mitigation measures have been recommended to minimise potential impacts of the proposal:

- The minimum amount of clearing should take place as a general objective of the project, particularly within those areas that contain *Eucalyptus aggregata*;
- Measures should be implemented to avoid impacts upon waterways and associated vegetation resulting from soil disturbance, namely adequate erosion and sedimentation controls with regular monitoring to ensure their functionality and condition;
- Appropriate measures should be employed to ensure that machinery working within the site does not bring materials (soils etc.) onto the sites that may infect onsite vegetation with *Phytophthora cinnamomi*; and
- Ongoing weed monitoring should be instituted and potential weed infestations be appropriately managed to ensure surrounding communities are protected from invasive species.

Contents

Figures

Tables

Appendices

1 Introduction

RPS Australia East (RPS) was engaged by Centennial Ivanhoe Pty Ltd to undertake an Ecological Assessment over Lidsdale Siding, approximately 10km north-west of Lithgow in NSW. This assessment was prepared to support an application for Project Approval under Section 75F the NSW Environmental Planning and Assessment Act 1979 (EP&A Act). The proposal is outlined in detail below and consists of upgrading the existing Lidsdale Siding rail loading facility by automating the train loading facility.

This report covers an area that contains the existing rail loading facility and proposed infrastructure, herewith referred to as the "project area". Areas surveyed also include surrounding areas, herewith referred to as the "study area". Their locations are shown in **Figure 1-1**.

This assessment aims to examine the likelihood of the proposal to have a significant effect on any threatened species, populations or ecological communities listed under the Threatened Species Conservation Act 1995 (TSC Act 1995). The report recognises the relevant requirements of the EP&A Act as amended by the Environmental Planning and Assessment Amendment Act 1997. Assessment is also made with regard to those species and communities listed federally under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999).

The Director General's Requirements (DGRs) (issued on 7 July 2011) apply to this assessment. The DRGs relevant to ecology requires:

- a detailed assessment of the potential impacts of the project on any terrestrial or aquatic threatened species or populations, or their habitats, endangered ecological communities or groundwater dependent ecosystems; and
- a detailed description of the measures that would be implemented to avoid or mitigate impacts on biodiversity.

1.1 Site Particulars

Locality - Lidsdale siding is located near the village of Lidsdale in the NSW Western Coalfield.

LGA - Lithgow.

Area - The detailed description of the proposed modifications follows with respect to the Project Area that comprises a diversion chute, auxiliary stockpile, elevated conveyor, train loading bin, ground conveyor, spillage pit, control room, track extension to existing rail siding, water supply and reticulation upgrade, new transformer, fence erection and refuelling and storage infrastructure. This equates to approximately

40ha, however the actual infrastructure covers a portion of this. The total area of the Study Area is approximately 108.1ha.

Boundaries - Lidsdale Siding is bordered on the southern side by Main Street which runs south west from the Castlereagh Highway. On the northern side is cleared land followed by State forest to the west and northwest.

Current Land Use - The land is currently owned and run by Centennial Ivanhoe as a coal load out facility.

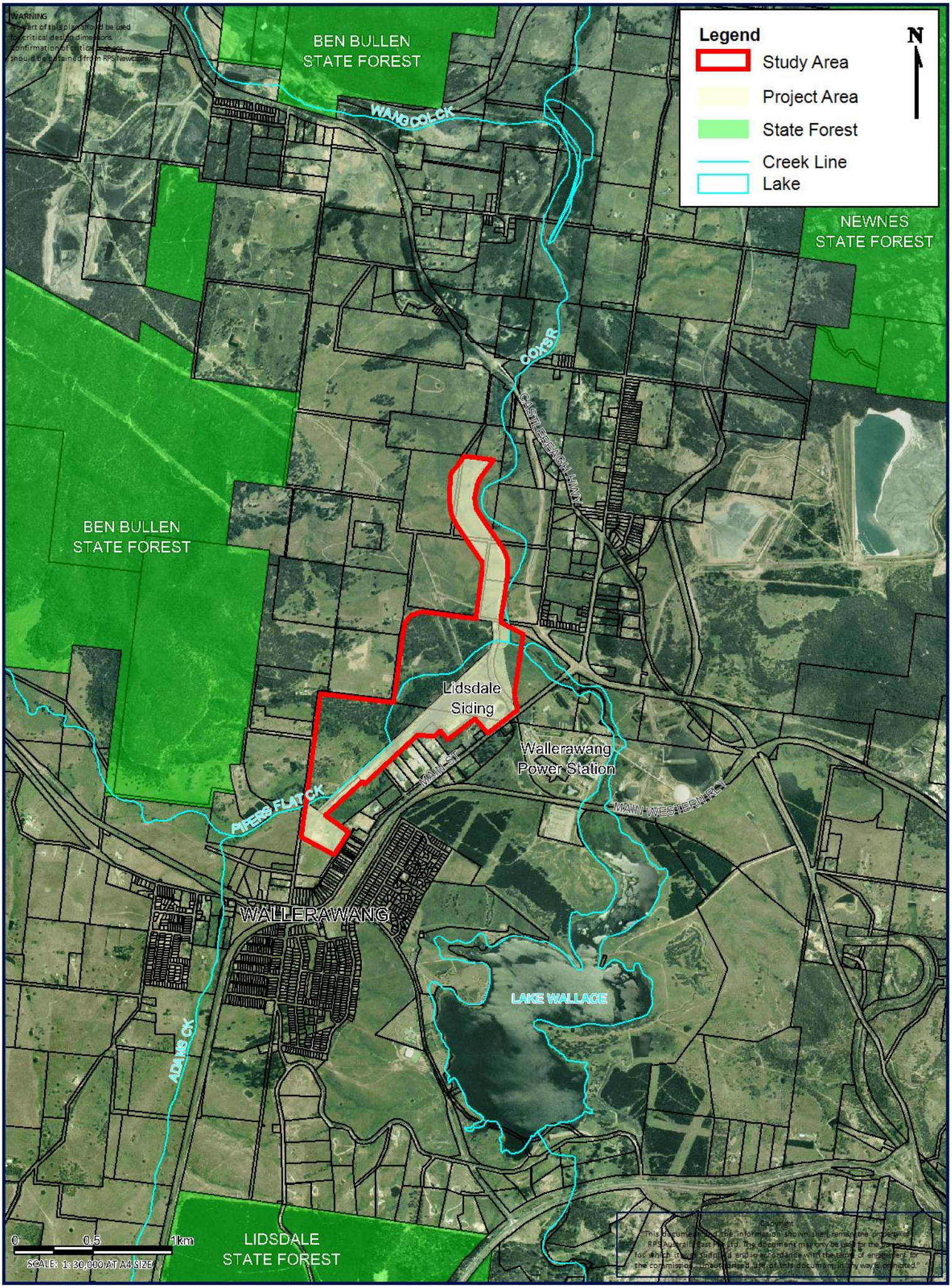
Topography - The landscape in this region ranges from flat to gently inclining rises on broad valley floors (<300 m). Elevation in the area is between 800 m – 1000 m (King 1993). Two major topographic landscapes dominate the region: the Cullen Bullen and the Pipers Flat landscape. Slopes range from 10-15%. Localised outcrops occur at low scarps.

Soils - The study area lies within the Western Coalfield of NSW. The area is covered by the Bathurst-Sydney 1:250,000 geological maps. The uppermost geological unit across the area is the Narrabeen Group, comprising shale, sandstone and conglomerates of freshwater origin of the Caley Formation and Grose Sub-Group.

1.2 Description of the Proposal

Centennial is proposing to upgrade the existing Lidsdale Siding rail loading facility by automating the transfer of coal from the existing overland conveyor onto trains. The project will require the construction of above and below ground facilities, including a stockpile conveyor, an extension and duplication of the existing rail siding, loading bin, new above and below ground conveyor, and coal stock piles.

In the process of designing the Lidsdale Siding rail loading facility upgrade, due consideration has been afforded to the ecological constraints as determined by this report. As a result, the design has been restricted predominantly to those unvegetated areas that are currently used for ongoing site operations. The only physical component of the proposed development which may impact on vegetated areas is the extensions of the rail spur and shunt line. The land impacted by this extension represents cleared agricultural land. Native vegetation will generally not be impacted by the proposed development, however some trimming or minor tree removal may be necessary during construction to allow safe clearance from the rail line. The land to the north of the siding, although not directly impacted by the operation of the facility, contains larger stands of native vegetation communities. These communities were surveyed as part of the wider study area and are also detailed within this report. The locations of the proposed components are provided in **Figure 1-2**.

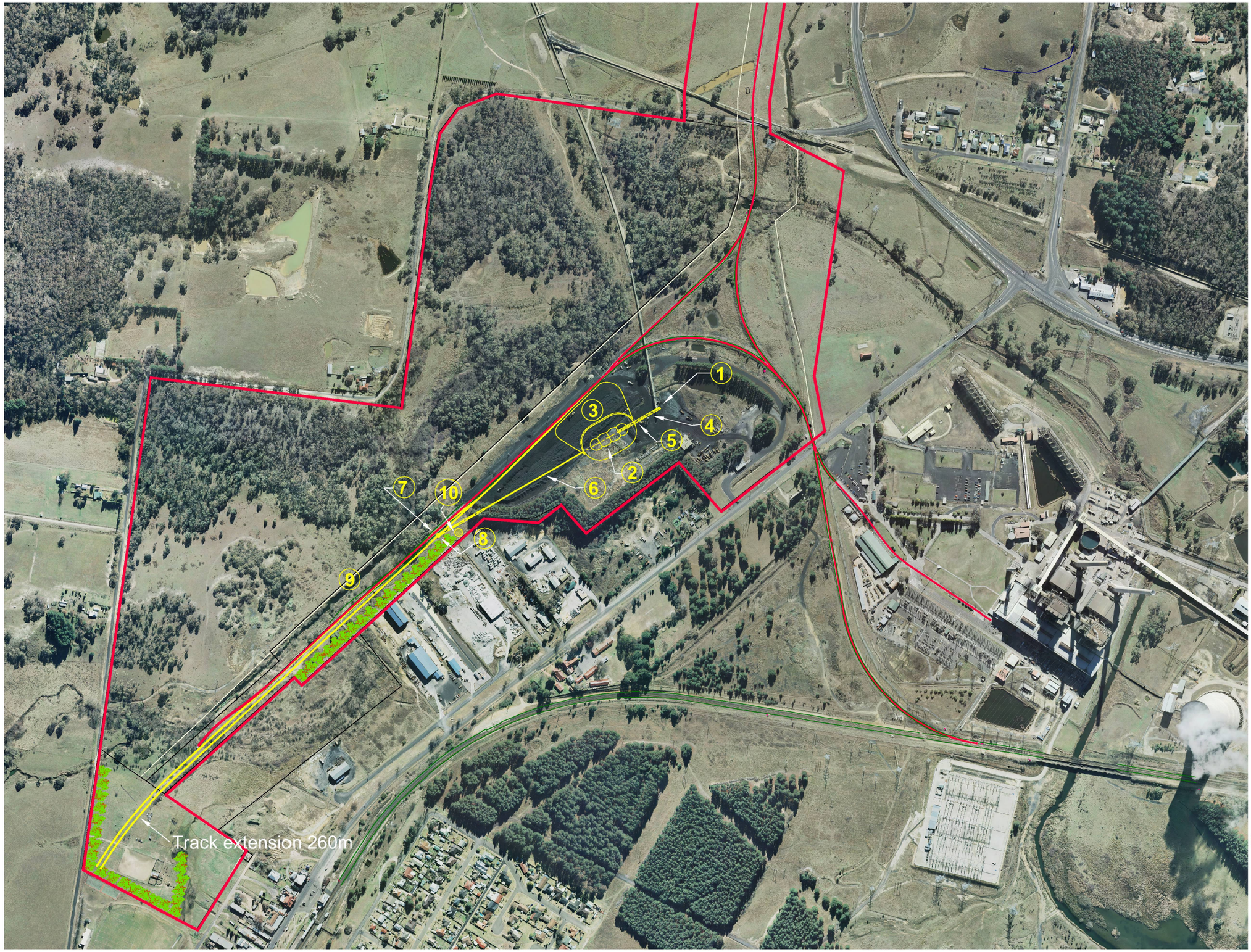


TITLE: FIGURE 1-1: SITE LOCATION | LOCATION: LIDSDALE SIDING | DATUM: (GDA 94) PROJECTION: MGA ZONE 56 | DATE: 14/08/2012 PURPOSE: REPORT FIGURE | LAYOUT REF: 105704 Neubecks - Blackmans Flat\10- Drafting\ Lidsdale Sidings VERSION (PLAN BY)B A4 (PH-NW)

CLIENT: CENTENNIAL COAL
JOB REF: 105704

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS



N

Proposed Components:

1. Diversion chute at the end of the existing overland conveyor (Auxiliary Stockpile beneath)
2. 50 000 t elongated conical stockpile
3. General Pushout Area for elongated conical stockpile
4. Elevating conveyor to elongated conical stockpile
5. Reclaim tunnel beneath the stockpile.
6. Ground conveyor from the reclaim tunnel, elevating to the train loading bin
7. A train loading bin (nominal 250 tonne capacity)
8. Control room adjacent to the loading bin
9. Notional alignment of New Rail Line and adjacent shunt
10. Transtank

Lidsdale Siding Study Area

EXISTING RAIL LINE

PROPOSED COMPONENTS

LANDSCAPING BUFFER

0 100 200 300 400

SCALE 1 : 7000 (A3)

TITLE: FIGURE 1-2: PROPOSED COMPONENTS | LOCATION: WALLERAWANG | DATUM: (GDA 94) PROJECTION: MGA Zone 56 | 10TH MAY 2012 ENV. ASSESSMENT | AUTOCAD REF: ECO FIGURE VERSION (PLAN BY): PROPOSED 2

CLIENT: CENTENNIAL COAL
JOB REF: 105704

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

creativepeople making a difference

RPS

1.3 Scope of the Study

The scope of this ecological assessment report is to:

- identify vascular plant species found on the site;
- identify and map existing vegetation communities;
- assess the status of identified plant species and vegetation communities under relevant legislation;
- identify existing habitat types on the site and assess the habitat potential for threatened species, populations, or ecological communities known from the proximate area;
- identify threatened fauna potentially using the site; and
- assess the potential of the proposal to have a significant impact on any threatened species, populations or ecological communities identified during field surveys or as having potential habitat on the site.

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 on the site;
- provide information to enable compliance with applicable assessment requirements contained within the TSC Act 1995, EP&A Act 1979, the EPBC Act 1999, and any other relevant state, regional and local environmental planning instruments; and
- enable the provision and analysis of ecological data that is comparable with data for other sites within the region to ensure continuity and consistency for survey and results.

1.4 Qualifications

This report was written by Paul Hillier B.Env.Sc. and Lauren Vanderwyk B. Sc. with input from Matt Doherty (B.LMC) and Chris McLean B.EnvSc (hons) of RPS. The academic qualifications and professional experience of all RPS consultants involved in the project are documented in **Appendix 3**.

1.5 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); andCertificate 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).

1.6 Certification

As the principal author, I, Paul Hillier, make the following certification:

- The results presented in the report are, in the opinion of the principal author and certifier, a true and accurate account of the species recorded, or considered likely to occur within the site;
- Commonwealth, state and local government policies and guidelines formed the basis of project surveying methodology, or where the survey work has been undertaken with specified departures from industry standard guidelines, details of which are discussed and justified in **Section 2.5**; and
- All research workers have complied with relevant laws and codes relating to the conduct of flora and fauna research, including the *Animal Research Act 1995*, *National Parks and Wildlife Act 1974* and the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes*.

Principal Author and Certifier:

Paul Hillier
Senior Ecologist
May 2012

2 Methodology

Ecological surveys within the specific designated search areas were carried out by two ecologists from RPS on the 13th - 16th of December 2010, 29th - 31st August 2011, 27th of September 2011 and the 7th and 9th February 2012. The surveys included site inspections to identify initial constraints to inform project design; vegetation community surveys and various fauna survey methods including Elliot trapping, diurnal bird and herpetological surveys, bat echolocation recording, spotlighting/call playback, opportunistic sightings and habitat assessments. Targeted searches for threatened flora and fauna species were also undertaken.

2.1 Literature Review

A literature review was undertaken to assist in identifying distributions, suitable habitats and known records of threatened species so that field investigations could more efficiently focus survey effort. Information sources included:

- Aerial Photograph Interpretation (API) and literature reviews to determine the broad categorisation of vegetation within the site;
- Review of the Vegetation of the Western Blue Mountains – including the Capertee, Coxs, Jenolan and Gurnang Areas (DEC 2006);
- Review of fauna and flora records contained in the Office of Environment and Heritage (OEH) Atlas of NSW Wildlife (accessed February 2012) within a 10km radius of the site;
- Department of Sustainability, Environment, Population and Communities (SEWPAC) EPBC Act 1999 Protected Matters Search (accessed February 2012) within a 10km radius of the site;
- OEH Threatened Species, Populations and Ecological Communities website (*http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/*);
- Birdata (web version of Birds Australia's New Atlas of Australian Birds);
- A review of Geographic Information System (GIS) data including (but not limited to) aerial photography, topographic maps, State Environmental Planning Policy (SEPP) Mapping, Soil Landscapes and Acid Sulphate Soil Potential; and
- Collective knowledge gained from extensive work in the area.

2.2 Flora Survey

2.2.1 Vegetation Mapping

Flora surveys and vegetation mapping carried out on the site has been undertaken as follows:

- Review of the Vegetation of the Western Blue Mountains – including the Capertee, Coxs, Jenolan and Gurnang Areas (DEC 2006);
- Confirmation of the community type(s) present (dominant species) via undertaking flora surveys and identification;
- Consideration was given to the potential for the derived vegetation communities to constitute 'Endangered Ecological Communities' (EECs) as listed under the TSC Act 1995 and/or EPBC Act 1999; and
- Map the type and general extent of the communities present into definable map units where appropriate using a combination of Air Photo Interpretation (API) and ground truthing surveys.

2.2.2 Significant Flora Survey

A list of potentially occurring significant flora species from the locality (10km radius) was compiled, which included threatened species (Endangered or Vulnerable) and EECs listed under the TSC Act 1995 and/or EPBC Act 1999.

Two ecologists undertook targeted flora searches on all visits between 2010 and 2012. In line with methodology such as the "Random Meander Technique" described by Cropper (1993) targeted searches were conducted across the site. Searches for threatened flora species were also undertaken during traverses throughout the wider areas of the site, which were undertaken to delineate vegetation community boundaries within the study area.

Particular intensive targeted flora surveys were undertaken within habitats potentially suitable for *Eucalyptus aggregata* (Black Gum), Capertee Stringybark (*Eucalyptus cannonii*), Austral Toadflax (*Thesium australe*) and *Derwentia blakelyi*, as these species are known to occur in the immediate locality of the study area. The locations of any threatened flora species that were found within close proximity to the project area were recorded by the use of Trimble differential GPS units with sub-metre accuracy.

2.3 Habitat Survey

An assessment of the relative habitat value present on site was undertaken. This assessment focused primarily on the identification of specific habitat types and resources on the site favoured by known threatened species from the region. The assessment also considered the potential value of the site (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.

2.4 Fauna Survey

The fauna survey methodology initially consisted of the production of an observed and expected fauna species list for the area and an assessment of the potential use of the site by threatened fauna species (as listed under the TSC Act 1995 and/or EPBC Act 1999) identified from the vicinity of the site. This was achieved by undertaking literature and database reviews followed by confirmation through field surveys, and any additional species observed were noted on the list.

Field surveys included: Elliot trapping, Bat Echolocation Call Recording, Avifauna Surveys, Herpetofauna Surveys, Spotlighting / Call Playback, Secondary Indications and Incidental Observations.

The location and effort of each fauna survey methodology (as shown in **Figure 2-1**) was determined based on the fauna habitat located within the site via stratification of the site into habitat types.

2.4.1 Terrestrial Elliot Trapping

Terrestrial trapping was undertaken using Elliott A, Elliott B and cage traps set in three transects for four nights. The Elliott traps were baited with a mixture of rolled oats, peanut butter and honey. Cage traps were baited with chicken necks or chicken thighs. Traps were checked early each morning, with any captures identified and released at point of capture. Traps were re-baited where necessary. The location of each trap line is shown in **Figure 2-1**.

Terrestrial traps targeted small terrestrial mammals such as dasyurids (eg. antechinus and dunnarts) and rodents (eg. rats and mice). A total of 3 trapping transects were undertaken within the site, resulting in a total of 100 Elliot A, 72 Elliot B and 12 cage trap nights within the site.

2.4.2 Arboreal Elliot Trapping

Arboreal trapping was undertaken using Elliott B size traps set for four nights. Traps were mounted on brackets set at approximately 2 m height on trees with a DBH greater than 30 cm. Traps were baited with a rolled oats, peanut butter and honey mixture and the tree trunks were sprayed liberally with a brown sugar and water mix each day in the late afternoon. Traps were checked early each morning. The location of each trap line is shown on **Figure 2-1**.

Arboreal traps targeted arboreal mammal species such as gliders (eg. squirrel and sugar gliders) and possums (eg. ringtails). A total of 3 trapping transects, with 5 traps in each line were undertaken within the site over four nights, resulting in a total of 60 arboreal trap nights within the site.

2.4.3 Bat Echolocation Call Recording

Bat echolocation calls were recorded using two Anabat II Detector units set to remotely record for the entire night. Anabat surveys were undertaken on the 13th, 14th and 15th of December 2010. On each survey night two bat detectors were left out for the full night, resulting in approximately 72 hours of bat surveys. The location of each bat call survey site is shown on **Figure 2-1**.

Bat call analysis was undertaken by Anna McConville who is experienced in the analysis of bat echolocation calls.

2.4.4 Avifauna Survey

The presence of avifauna on the site was undertaken via targeted diurnal and nocturnal surveys and by opportunistic observations during field surveys. Birds were identified by direct observation, by recognition of calls or through recognition of distinctive features such as nests, feathers, and owl regurgitation pellets etc. The potential for threatened avifauna to use the site was also assessed by identification of habitat attributes occurring within the site and their capacity to support threatened species that are known to occur in the wider locality.

Nocturnal surveys undertaken during spotlighting, attempted to identify roosting birds in a similar fashion to methods employed during diurnal surveys. Pre-recorded calls of owl species with the potential to occur within the site were broadcast in an effort to elicit vocal responses from the owls or to attract an owl to the playback site. The calls were broadcast through an amplification system (a hand held megaphone) designed to project the sound for at least 1km under still night conditions. As described by Kavanagh and Peake (1993) and Debus (1995), the call of each species was broadcast for at least five minutes, followed by five minutes of listening, and stationary spotlighting. Following the final broadcast and listening, the area was spotlighted on foot. Species broadcasted included *Ninox strenua* (Powerful Owl), *Ninox connivens* (Barking Owl), *Tyto tenebricosa* (Sooty Owl) and *Tyto novaehollandiae* (Masked Owl).

A total of 5 nights of call playback were undertaken within the site (13th and 14th December 2010, 29th and 30th August 2011 and 27th September 2011). Call playback was undertaken in two specific elevated locations during each visit. The locations of the call playback sites are shown in **Figure 2-1**.

Opportunistic diurnal bird surveys were undertaken on each site visit between 2010 and 2012.

2.4.5 Herpetofauna Survey

Opportunistic and targeted herpetofauna searches were conducted during fauna surveys encompassing a diversity of habitats across the site. Known occurrences of threatened herpetofauna species from the region were taken into account during assessment of onsite habitat, to determine the potential for the site to support such species.

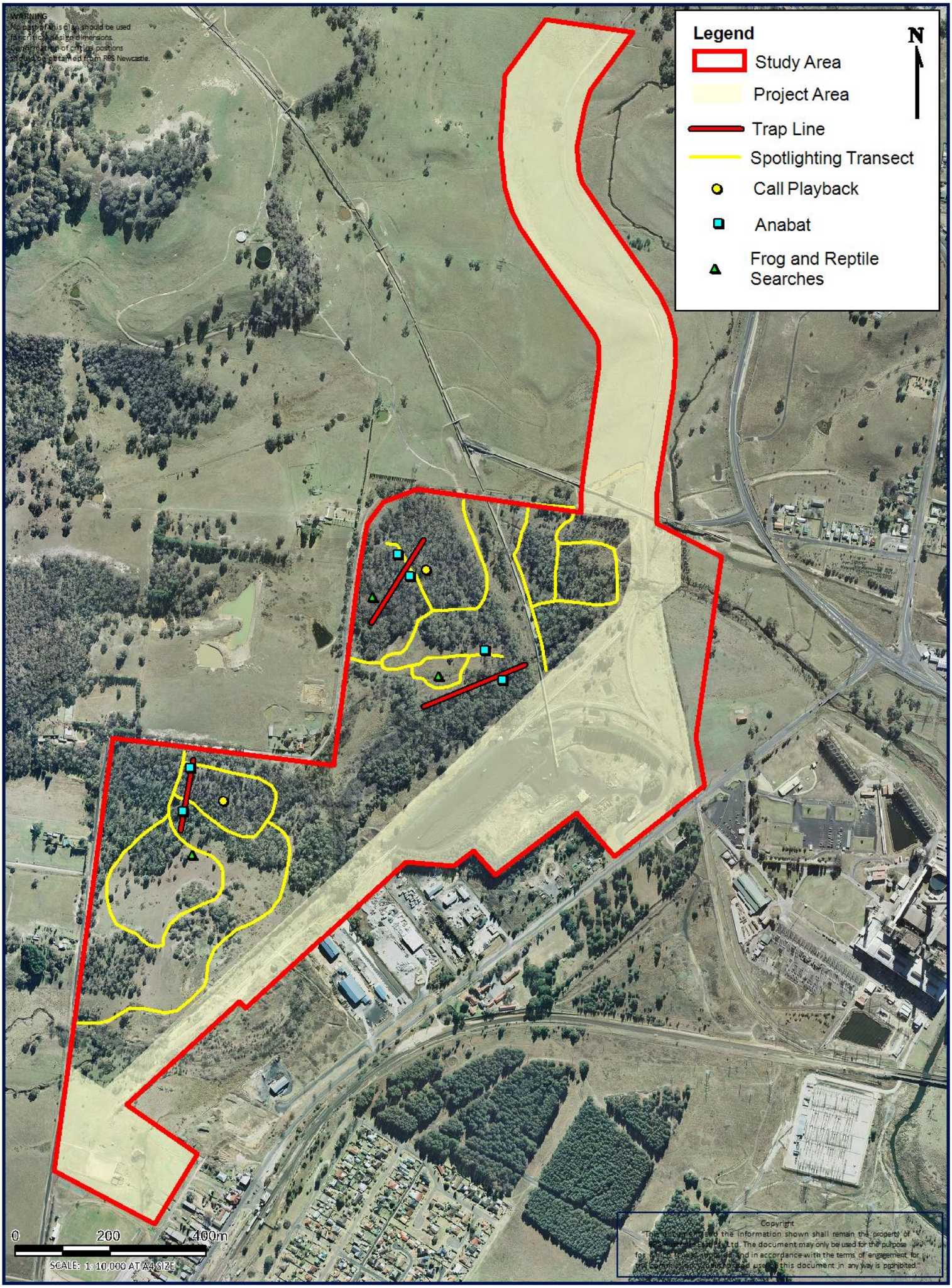
2.4.6 Spotlighting

Spotlighting was undertaken across the site via the use of 75-Watt hand-held spotlights and head torches during walking. A total of 30 person hours of spotlighting was undertaken over five nights (13th and 14th December 2010, 29th and 30th August 2011 and 27th September 2011) within the site (**Figure 2-1**). The methodology discussed in Section 2.4.4 for call playback was also undertaken during spotlighting.

2.4.7 Secondary Indications and Incidental Observations

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

- Distinctive scats and scents left by mammals;
- Collection of predator scats for analysis;
- Nests made by various guilds of birds;
- Whitewash, regurgitation pellets and prey remains from Owls;
- Skeletal material of vertebrate fauna;
- The calls of fauna; and
- Footprints left by mammals.



TITLE: FIGURE 2-1: FAUNA SURVEY LOCATIONS

LOCATION: LIDSDALE SIDING

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 14/08/2012
PURPOSE: REPORT FIGURE

LAYOUT REF: 105704 Neubecks - Blackmans Flat\10- Drafting\ Lidsdale Sidings
VERSION (PLAN BY): B A4 (PH-NW)

CLIENT: CENTENNIAL COAL
JOB REF: 105704

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

2.5 Survey Limitations

The limitations associated with this Ecological Assessment Report are presented herewith. The limitations have been taken into account specifically in relation to threatened species assessments, results and conclusions.

In instances where surveys were not able to reliably detect a particular species or guild, a precautionary approach has been adopted; as such 'assumed presence' of known and expected threatened species, populations and ecological communities has been made where relevant and scientifically justified to ensure a holistic assessment. It is noted that due to the positioning of the proposed development within highly disturbed areas, these limitations are concerned with the understanding of the ecology of the wider study area, however the surveys are considered adequate, given the size nature of the actual development.

2.5.1 Flora Species / Communities

The seasonality of the surveys places limits on the number of flora species identified on the site. Whilst seasonal surverys have been undertaken, the cryptic nature of a number of flora species means that surveys may not have been able to detect species, despite potentially being present. There is a range of common albeit cryptic plant species that have a brief flowering period and hence small 'window' of effective 'detectability'. 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 site based on survey effort, timing and ecological factors.

2.5.2 Fauna Species

The presence of fauna within a particular area is not static over time and may be seasonal in response to the availability of resources. The environmental conditions during which fauna surveys are undertaken greatly influence the species which are recorded. In terms of herpetofauna, conditions such as humidity, rainfall, temperature and barometric pressure can greatly affect the detectability of certain species. As such, where survey effort, targeting particular threatened fauna species, has not specifically met guidelines recommended by DEC 2004, habitat assessment and prediction of the occurrence of threatened fauna species has been applied. Furthermore, a precautionary approach has been adopted for species which potentially occur on site.

Flowering and fruiting plant species, which attract some nomadic or migratory threatened species, often fruit or flower in cycles spanning a number of years. Furthermore, these resources might only be accessed in some areas during years when resources otherwise more accessible to threatened species fail. As a consequence threatened species may be absent from some areas even where potential habitat exists for extended periods.

Nevertheless, it is considered that the combined survey effort and dataset from all of the investigations undertaken in the region to date provide a substantial picture of the fauna species and habitat values occurring within the site.

2.5.3 Data Availability and Accuracy

The collated threatened flora and fauna species records provided by the Office of Environment and Heritage (OEH) (2011) for the region are known to vary in accuracy and reliability. Traditionally this is due to the reliability of information provided to OEH for collation and/or the need to protect specific threatened species locations. During the review of threatened species records sourced from the Atlas of NSW Wildlife (2011) by OEH, consideration has been given to the date and accuracy of each threatened species record in addition to an assessment of habitat suitability within the site.

Similarly EPBC Protected Matters Searches provide a list of threatened species and communities that have been recorded within 10km, or which have suitable habitat within the wider area and are subject to the same inherent inaccuracy issues as State derived databases.

In order to address these limitations in respect to data accuracy, threatened species records have been used to provide a guide only to the types of species which occur within the locality of the site. As a consequence habitat assessment and the results of surveys conducted within the site have been used to assess the likelihood of occurrence of threatened species, populations and ecological communities to occur within the site.

3 Results

3.1 Flora Survey

125 species of flora were recorded during quadrat surveys and opportunistically across the site. These species are summarised in **Appendix 2**.

3.1.1 Vegetation Community Mapping

The Vegetation of the Western Blue Mountains – including the Capertee, Coxs, Jenolan and Gurnang Areas (DEC 2006) mapped six vegetation communities within the study area, namely:

- Map Unit (MU)15 – Tableland Hollows Black Gum - Black Sally Open Forest;
- MU 37 – Coxs Permian Red Stringybark - Brittle Gum Woodland;
- MU 59 – Non-native Vegetation - Pine plantation / woodlot / shelter;
- MU 60 – Non-native Vegetation - Other exotics (willow etc);
- MU 61 – Unclassified (<1ha patch of remnant vegetation adjacent / within cleared lands); and
- MU 62 – Cleared and Severely Disturbed Lands.

Ground truthing of vegetation of the study area by RPS ecologists redescribed MU61 and confirmed the presence of two additional vegetation communities, namely:

- MU 11 – Tableland Gully Snow Gum – Ribbon Gum Grassy Forest; and
- MU 33 – Tableland Broad-leaved Peppermint - Brittle Gum- Red Stringybark Grassy Open Forest.

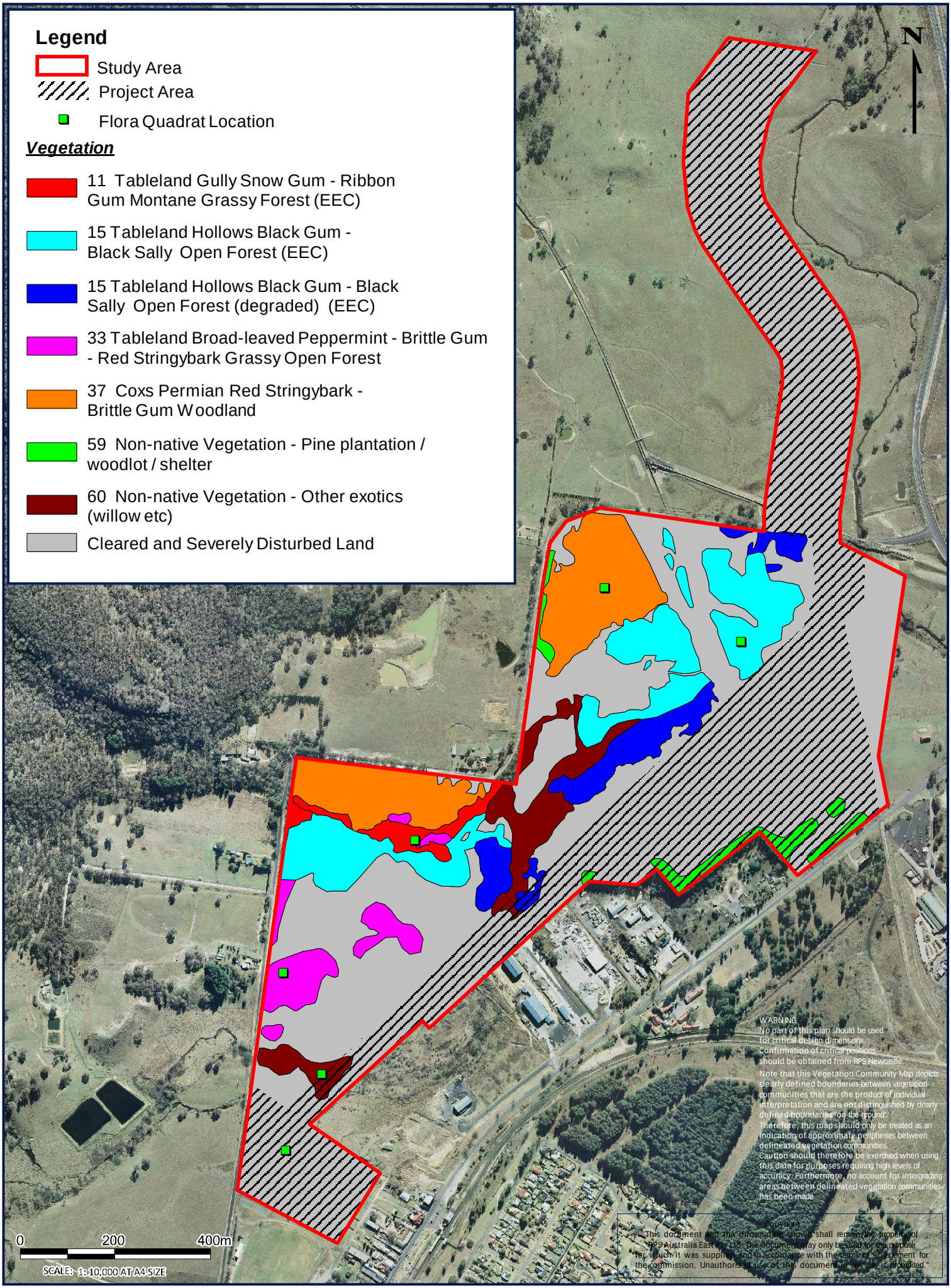
The area of each vegetation community within the study area has been calculated and is outlined in **Table 3-1**. It should be noted that only a very small portion of regrowth native vegetation lies within the project area but only a few individual trees located close to the existing rail line may be impacted by the proposed development.

Table 3- 1: Areas of Vegetation Communities on Site

	Vegetation Community	Area (ha) within study area	Area (ha) within project area
MU 11	Tableland Gully Snow Gum - Ribbon Gum Montane Grassy Forest	1.5	-
MU 15	Tableland Hollows Black Gum - Black Sally Open Forest (degraded)	3.9	0.25
MU 15	Tableland Hollows Black Gum - Black Sally Open Forest	10.3	-
MU 33	Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest	2.8	-
MU 37	Coxs Permian Red Stringybark - Brittle Gum Woodland	9.0	-

	Vegetation Community	Area (ha) within study area	Area (ha) within project area
MU 59	Non-native Vegetation - Pine plantation / woodlot / shelter	1.5	1.5
MU 60	Non-native Vegetation - Other exotics (willow etc)	4.1	0.44
MU 62	Cleared and Severely Disturbed Land	75.0	37.49
Total		**108.1**	**39.69**

Refer to **Figure 3-1** for the vegetation communities delineated by RPS. Below provides a description of the communities identified. Vegetation communities have been described and named in accordance with Vegetation of the Western Blue Mountains (DEC 2006).



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.

TITLE: FIGURE 3-1: VEGETATION COMMUNITIES
LOCATION: LIDSDALE SIDING
DATUM: (GDA 94)
PROJECTION: MGA ZONE 56
DATE: 14/08/2012
PURPOSE: REPORT FIGURE
LAYOUT REF: 105704 Neubecks - Blackmans Flat\10- Drafting\ Lidsdale Sidings
VERSION (PLAN BY):B A4 (PH-NW)

CLIENT: CENTENNIAL COAL
JOB REF: 105704

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

MU 11 - Tableland Gully Snow Gum – Ribbon Gum Grassy Forest

Plate 3-1: Tableland Gully Snow Gum – Ribbon Gum Grassy Forest

Description: A tall forest with a dense grassy undercover that occupies lower slopes of the site. Covers approximately 1.5ha of the study area.

Canopy Layer: Dominated by *Eucalyptus rubida* subsp. *rubida* (Candlebark) and *Eucalyptus pauciflora* (Snow Gum). *Eucalyptus sieberi* (Silvertop Ash) was also recorded in low numbers.

Sub Canopy Layer: Dominated by juvenile canopy species and *Crataegus monogyna* (Hawthorn).

Shrub Layer: Dominated by *Acacia dealbata* (Silver Wattle) and partially invaded by *Rubus ulmifolius* (Blackberry).

Ground Layer: Dominated *Poa seiberiana* (Tussock Grass) and *Themeda australis* (Kangaroo Grass) with a range of herbs including *Dichondra repens* (Kidney Weed), *Glycine clandestina* (Twining Glycine) and *Desmodium varians* (Slender Tick-trefoil).

Classification: Classified as an EEC under the TSC Act as Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions.

MU 15 – Tableland Hollows Black Gum – Black Sally Open Forest

Plate 3-2: Tableland Hollows Black Gum – Black Sally Open Forest

Plate 3-3: Degraded Tableland Hollows Black Gum – Black Sally Open Forest

Description: A distinctive community found on the deep soils of alluvial flats in the Cox's and Gurnang areas. This community was found to contain a degraded understorey within the east and north of the study area, predominately due to weed invasion and past inundation. Covers approximately 14.2ha of the study area.

Canopy Layer: Dominated by *E. aggregata* and *Eucalyptus stellulata* (Black Sally). Canopy species recorded less frequently *E. pauciflora*, *E. rubida* subsp. *rubida* and *Eucalyptus viminalis* (Ribbon Gum).

Sub Canopy Layer: Dominated by juvenile canopy species.

Shrub Layer: Sparse, with *Leptospermum polygalifolium* (Tantoon) and *R. ulmifolius* present.

Ground Layer: Dominated by *Poa labillardieri* (River Tussock), *Imperata cylindrica* (Blady grass) and *T. australis*, with a range of herbs including *Geranium solanderi* (Cutleaf Cranesbill), *Wahlenbergia stricta* (Austral Bluebell) and *Ajuga australis* (Austral Bugle).

Classification: Classified as an EEC under the TSC Act as Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions.

MU 33 – Tableland Broad-leaved Peppermint - Brittle Gum- Red Stringybark Grassy Open Forest

Plate 3-4: Tableland Broad-leaved Peppermint - Brittle Gum- Red Stringybark Grassy Open Forest

Description: Occurs on the higher western rolling terrain of the Cox's Valley. Covers approximately 2.8ha of the study area.

Canopy Layer: Dominated by *Eucalyptus dives* (Broad-leaved Peppermint) with *E. rubida* subsp. *rubida* in low numbers occurring in some areas, growing to a height of around 12m.

Sub Canopy Layer: Sparse, dominated by juvenile canopy species and a few individual non-native *C. monogyna* trees.

Shrub Layer: No shrub layer was recorded within this community.

Ground Layer: Dominant species were a combination of native and exotic ground layer species including *P. seiberiana, Lomandra filiformis* (Wattle Mat-rush), *Hypochaeris radicata* (Catsear), *Hypericum perforatum* (St. Johns Wort), *T. australis* and *Austrodanthonia tenuior.*

MU 37 – Cox's Permian Red Stringybark – Brittle Gum Woodland

Plate 3-5: Cox's Permian Red Stringybark – Brittle Gum Woodland

Description: Cox's Permian Red Stringybark- Brittle Gum Woodland occurs on the Permian escarpment slopes and exposed ridges and is a low (~12m) open woodland. Covers approximately 9.0ha of the study area.

Canopy Layer: Dominated by *Eucalyptus mannifera* (Brittle Gum) and *E. pauciflora* to a height of 15m.

Sub Canopy Layer: Dominated by juvenile canopy species.

Shrub Layer: Sparse, dominated by *Lissanthe strigosa* (Peach Heath). Also includes *Cassinia aculeata* (Dolly Bush), *Pultenaea microphylla* and *Leucopogon virgatus*.

Ground Layer: Dominant species include *T. australis* and Wattle Mat-rush with *Hibbertia obtusifolia* (Hoary guinea flower), *Lomandra longifolifa* (Spiny-headed Mat-rush) and *Dianella caerulea var producta* (Blue Flax-lily) also present.

MU 59 Non-native Vegetation - Pine plantation / woodlot / shelter

Description: This community occurs as screen plantings for the stockpile site and along a short length in the west of the study area. This community is dominated by mature *Pinus Radiata* (Radiata Pine). Covers approximately 1.5ha of the study area.

Plate 3-6: Non-native Vegetation - Pine plantation

MU 60 - Non-native Vegetation – Other Exotics

Plate 3-7: MU 60 - Non-native Vegetation – Other Exotics

Description: Non native vegetation that has been previously cleared. and consists largely of introduced species. Covers approximately 4.1ha of the study area.

Canopy Layer: Crack Willow (*Salix fragilis*) was the dominant canopy species in this community. Low numbers of *E. aggregata* were also recorded.

Sub Canopy Layer: Dominated by juvenile canopy species.

Shrub Layer: Includes non native species such as *R. ulmifolius* and *C. monogyna*.

Ground Layer: Largely composed of exotic grasses and herbs such as *H. perforatum, Plantago lanceolata* (Lamb's Tongues)*, H. radicata* and *Trifolium repens* (White Clover).

MU 62 - Cleared and Severely Disturbed Land

Plate 3-8: MU 62 - Cleared and Severely Disturbed Land

Description: This community consists of severely disturbed lands with a high amount of exotic species. Covers approximately 75ha of the study area.

Canopy Layer: Scattered individuals occur throughout with tree species reflective of the communities that would have historically occurred.

Sub Canopy Layer: No sub canopy layer was recorded within this community.

Shrub Layer: A low shrub layer consisting largely of *R. ulmifolius* and *C. monogyna*.

Ground Layer: Within the open paddocks the groundloayer was dominated by exotic species including *H. radicata, P. lanceolata, Echium plantagineum* (Paterson's Curse) and *Centaurium erythraea* (Common Centaury). *Cynodon dactylon* (Couch) was the dominant native grass recorded in this community. Those cleared areas that were located amoungst areas of forest and woodland had a characteristics ground layer more reflective of their past comunites, such as *P. seiberiana* and *T. australis*.

3.1.2 Significant Flora

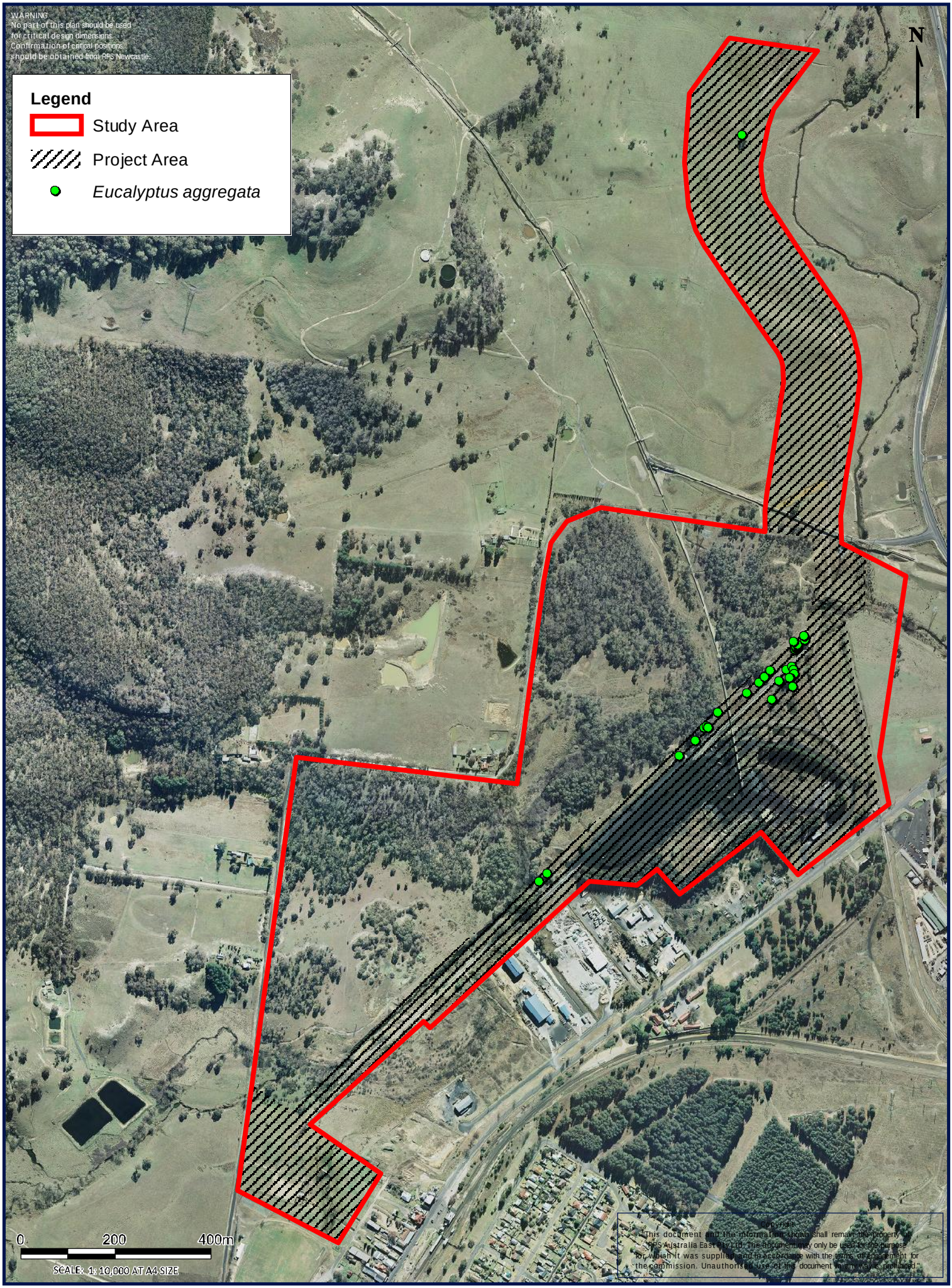
The results of database searches (NPWS Atlas of NSW Wildlife and EPBC Protected Matters Search) indicated that twelve threatened flora species have been previously recorded within 10km of the site (the locality) and/or have potential habitat within the site. The threatened flora species that have been recorded (in **bold**) or have the potential to occur within the locality of the site include:

Table 3-1: Threatened Flora found within 10km of the Study Site

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	NPWS Atlas records
Astrolasia elegans	-		E*	
Boronia deanei	Deane's Boronia	V	V*	
Derwentia blakelyi	-	V	-	32
Eucalyptus aggregata	**Black Gum**	V	-	14
Eucalyptus cannonii	Capertee Stringybark	V	-	11
Eucalyptus pulverulenta	Silver-leafed Gum	V	V	1
Euphrasia arguta	-	PD-CE	CE	
Genoplesium superbum	Superb Midge Orchid	E	-	1
Persoonia hindii	-	E	-	12
Prasophyllum sp. Wybong	a leek-orchid	-	V	
Pultenaea glabra	Smooth Bush-pea, Swamp	V	V	
Thesium australe	Austral Toadflax, Toadflax	V	V	

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

One threatened flora species, namely *E. aggregata* was recorded within the study area and was strongly associated with the vegetation community MU15. *E. aggregata* is listed as Vulnerable under the TSC Act. The recorded locations of *E. aggregata* are provided in **Figure 3-2**.



TITLE: FIGURE 3-2: LOCATION OF THREATENED FLORA SPECIES WITHIN THE PROJECT AREA

LOCATION: LIDSDALE SIDING

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 14/08/2012
PURPOSE: REPORT FIGURE

LAYOUT REF: 105704 Neubecks-Blackmans Flat\10- Drafting\Lidsdale Sidings
VERSION (PLAN BY): B A4 (PH-NW)

CLIENT: CENTENNIAL COAL
JOB REF: 105704

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

3.2 Habitat Survey

Habitats within the study area were assessed for their potential to support native flora and fauna species including threatened fauna for which records occur within the wider locality. Broad habitat types recorded within the site included; open forest areas, riparian/damp areas and cleared lands.

3.2.1 Terrestrial Habitats

The Tableland Hollows Black Gum - Black Sally Grassy Open Forest consists of a grassy understorey which provide suitable habitat for a number of terrestrial mammals, including macropods and wombats. The understorey structure in this community is generally lower than in other communities due to the natural absence of a shrub layer. The Red Stringybark- Brittle Gum woodland supports a more complex understorey and would also provide suitable habitat for a range of species.

Understorey structure is generally characterised with sufficient structural diversity and debris to provide foraging opportunities for a range of common and threatened woodland bird species (eg Varied Sitella, Brown Treecreeper) which may be occasional visitors to the site due to its tentative connectivity to adjoining State Forest.

The Red Stringybark- Brittle Gum woodland provides suitable habitat for the threatened flora species Capertee Stringybark and Silver-leafed Gum. The Tableland Hollows Black Gum - Black Sally Grassy Open Forest provides the most suitable habitat for the threatened *E. aggregata* and *T. australe*.

T. australe is hemiparasitic on the roots of Kangaroo Grass. Claeared areas containing this species are therfore also considered to provide suitable habitat for *T. australe*. Suitable low-lying cleared land, dominated by Kangaroo Grass occur in those areas immediate adjacent to the Tableland Hollows Black Gum - Black Sally Grassy Open Forest. Within cleared lands in the north of the Study Area and within the Project Area, there were no recorded patches of Kangaroo Grass and is therefore unlikely to provide suitable habitat for *T. australe*.

3.2.2 Arboreal Habitats

On the site numerous hollows occurred at a moderate density, reflecting the presence of hollow dependent arboreal mammal species. The presence of arboreal mammal populations on the site suggests that there are sufficient foraging opportunities to support forest owls, although a general paucity of large hollows places constraints upon breeding opportunities for these species.

Although no forest owl species were observed during targeted surveys it is likely that the site represents a portion of the local foraging range of both Barking (*Ninox connivens*) and Powerful Owls (*Ninox strenua*), due to the presence or likely presence of small terrestrial mammals and arboreal mammals, which are the respective prey of these owl species.

Due to the low abundance of large hollow bearing trees on the site, it is less likely that either of these species breed on the site.

3.2.3 Corridors and Habitat Linkages

The site is located to the southeast of a large (~500ha) remnant of native vegetation (state forest) with some corridor connectivity occurring. In the broader regional context several large blocks of native vegetation occur, including Lidsdale State Forest to the south of the study area and Ben Bullen State Forest to the north and west of the study area.

3.3 Project Area Habitat Value

Habitats within the project area are generally considered to be of low value due to their cleared nature and ongoing disturbances from the Lidsdale Siding operational activities and agricultural activities, predominately being pasture improvement and grazing. These disturbances have lessened the habitat opportunities and subsequent likelihood of occurrence within the project area of those threatened species considered to have potential to occur within the wider study area. One threatened flora species, namely *E. aggregata*, has been recorded within the project area, persisting as retained or regrowth trees, within cleared areas, adjacent to the existing rail line. Below is a series of photos showing the condition of the project area. Their locations are provided in **Figure 3-3**.

Plate 3-9: (Location 1) Southern Paddock (facing west).

Plate 3-10: (Location 2) Southern end of existing rail line (facing south)

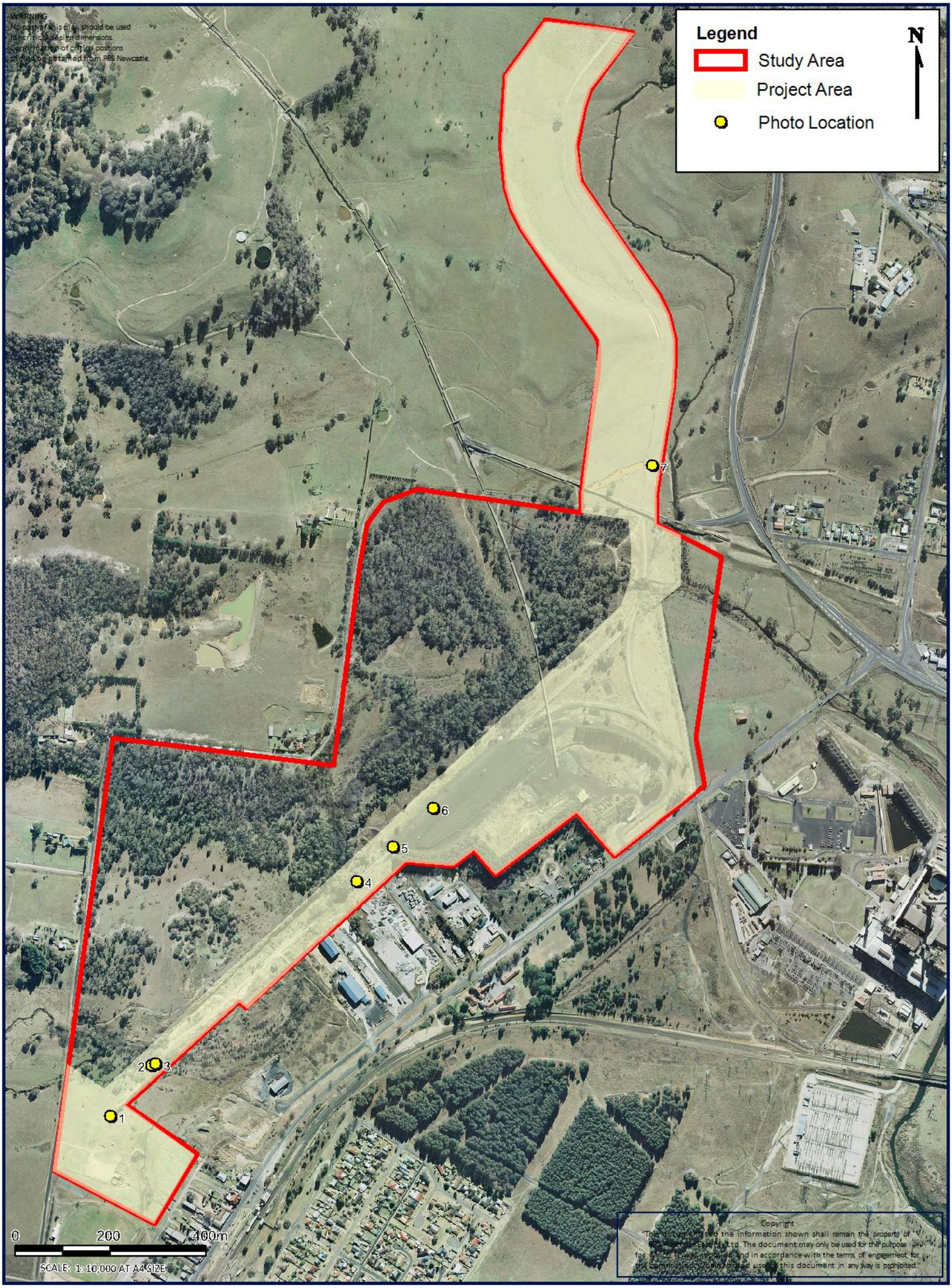
Plate 3-11: (Location 3) Southern end of existing rail line (facing north)

Plate 3-12: (Location 4) EEC within Project Area (looking south).

Plate 3-13: (Location 5) Lidsdale Rail Line (looking south)

Plate 3-14: (Location 6) Lidsdale Rail Line (looking north)

Plate 3-15: (Location 7) Northern Paddock (looking north)



TITLE: FIGURE 3-3: PROJECT AREA PHOTO LOCATIONS

LOCATION: LIDSDALE SIDING

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 14/08/2012
PURPOSE: REPORT FIGURE

LAYOUT REF: 105704 Neubecks - Blackmans Flat\10- Drafting\ Lidsdale Sidings
VERSION (PLAN BY): HB A4 (PH-NW)

CLIENT: CENTENNIAL COAL
JOB REF: 105704

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

3.4 Fauna Survey

3.4.1 Significant Fauna

The results of database searches (NPWS Atlas of NSW Wildlife and EPBC Protected Matters Search) indicated that 42 threatened fauna species have been previously recorded within 10km of the site (the locality) and/or have potential habitat within the site. The threatened fauna species that have been recorded (in **bold**) or have the potential to occur within the locality are provided in **Table 3-2**.

Table 3- 2: Threatened Fauna found or having potential to occur within 10km of the Study Site

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	NPWS Atlas records
Mixophyes balbus	Stuttering Frog	E1	V	1
Heleioporus australiacus	Giant Burrowing Frog	V	V	
Litoria booroolongensis	Booroolong Frog	E	E	
Litoria littlejohni	Littlejohn's Tree Frog	V	V	
Eulamprus leuraensis	Blue Mountains Water skink	E1	E	3
Hoplocephalus bungaroides	Broad-headed Snake	E1	V	1
Hieraaetus morphnoides	Little Eagle	V		4
Callocephalon fimbriatum	**Gang-gang Cockatoo**	V		39
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		5
Anthochaera phrygia	Regent Honeyeater	CE	E	
Lathamus discolour	Swift Parrot	E	E	
Leipoa ocellata	Malleefowl		V	
Rostratula australis	Australian Painted Snipe		V	
Ninox strenua	Powerful Owl	V		27
Ninox connivens	Barking Owl	V		10
Climacteris picumnus	Brown Treecreeper	V		27
Pyrrholaemus saggitatus	Speckled Warbler	V		3
Melithreptus gularis gularis	Black-chinned Honeyeater	V		2
Grantiella picta	Painted Honeyeater	V		1
Daphoenositta chrysoptera	Varied Sittella	V		8
Petroica phoenicea	Flame Robin	V		29
Petroica boodang	Scarlet Robin	V		37
Melanodryas cucullata	Hooded Robin	V		4
Stagonopleura guttata	Diamond Firetail	V		1
Dasyurus maculatus	Spotted-tailed Quoll	V	E	2
Phascolarctos cinereus	Koala	V		3
Potorous tridactylus	Long-nosed Potoroo	V	V	
Pseudomys fumeus	Smoky Mouse		E	
Pseudomys novaehollandiae	New Holland Mouse		V	
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	
Petaurus norfolcensis	Squirrel Glider	V		2
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		9

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	NPWS Atlas records
Nyctophilus timoriensis	Greater Long-eared Bat	V	V	
Miniopterus schreibersii	**Eastern Bentwing-bat**	V		9
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	8
Scoteanax rueppellii	Greater Broad-nosed Bat	V		5
Paralucia spinifera	Bathurst Copper Butterfly	E1	V	62
Petalura gigantea	Giant Dragonfly	E1		3
Maccullochella peelii peelii	Murray Cod		V	
Macquaria australasica	Macquarie Perch		E	
Macquaria australasica	Australian Grayling		V	

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

3.4.2 Terrestrial Mammals

Open forest communities containing grassy understorey components provide suitable habitat for a number of terrestrial mammals. One species of macropod was observed within the site, namely the Eastern Grey Kangaroo (*Macropus giganteus*). Evidence in the form of burrows was observed for the Common Wombat (*Vombatus ursinus*), although no individuals were recorded. Two terrestrial mammal species were recorded on the site, being the Red Fox (*Vulpes vulpes*) and Rabbit (*Oryctolagus cuniculus*). During Elliott trapping no small terrestrial mammals (eg Dasyurids or Rodents) were captured.

A full list of terrestrial mammals recorded within the site is provided in **Appendix 1**.

3.4.3 Arboreal Mammals

Canopy tree species and understorey proteaceous shrubs provide abundant foraging resources such as foliage, seeds pollen, nectar and invertebrates for possums, gliders and bats. Three arboreal mammal species, being the Sugar Glider (*Petaurus breviceps),* Common Ringtail Possum *(Pseudocheirus peregrinus) and* Common Brushtail Possum (*Trichosurus vulpecula*) were identified during spotlighting on site.

No other arboreal mammals were recorded during spotlighting surveys.

3.4.4 Bats

Six species of microchiropteran bat were positively identified from Anabat echolocation call recording within the study area. Of these one species is listed as threatened under the TSC Act namely the Eastern Bent Wing Bat (*Miniopterus schreibersii oceanensis*). Common species identified on the site included the White Striped Freetail Bat (*Austronomus australis*), Gould's Wattled Bat (*Chalinolobus gouldii*), Chocolate Wattled Bat (*Chalinolobus morio*), Large Forest Bat (*Vespadelus darlingtoni*) and Little Forest Bat (*Vespadelus vulternus*).

Additional bat species that are known to exist within the locality of the site, but could not be confidently identified to species level (those classified as possible or as a species group), include:

- *Mormopterus norfolkensis* (East-coast freetail bat)
- *Myotis macropus* (Large-footed myotis)
- *Nyctophilus geoffroyi* (Lesser long-eared bat)
- *Nyctophilus gouldi* (Gould's long-eared bat)
- *Scoteanax rueppellii* (Greater broad-nosed bat)
- *Scotorepens orion* (Eastern broad-nosed bat)

A full list of bat species recorded within the site is provided in **Appendix 1**.

3.4.5 Avifauna Survey

A moderate diversity of common open forest birds including those characterising elevated habitats were observed across the site. One threatened species, being the Gang-gang Cockatoo (*Callocephalon fimbriatum*) was recorded on the site. Bird species recorded on the site are summarised in **Appendix 1**.

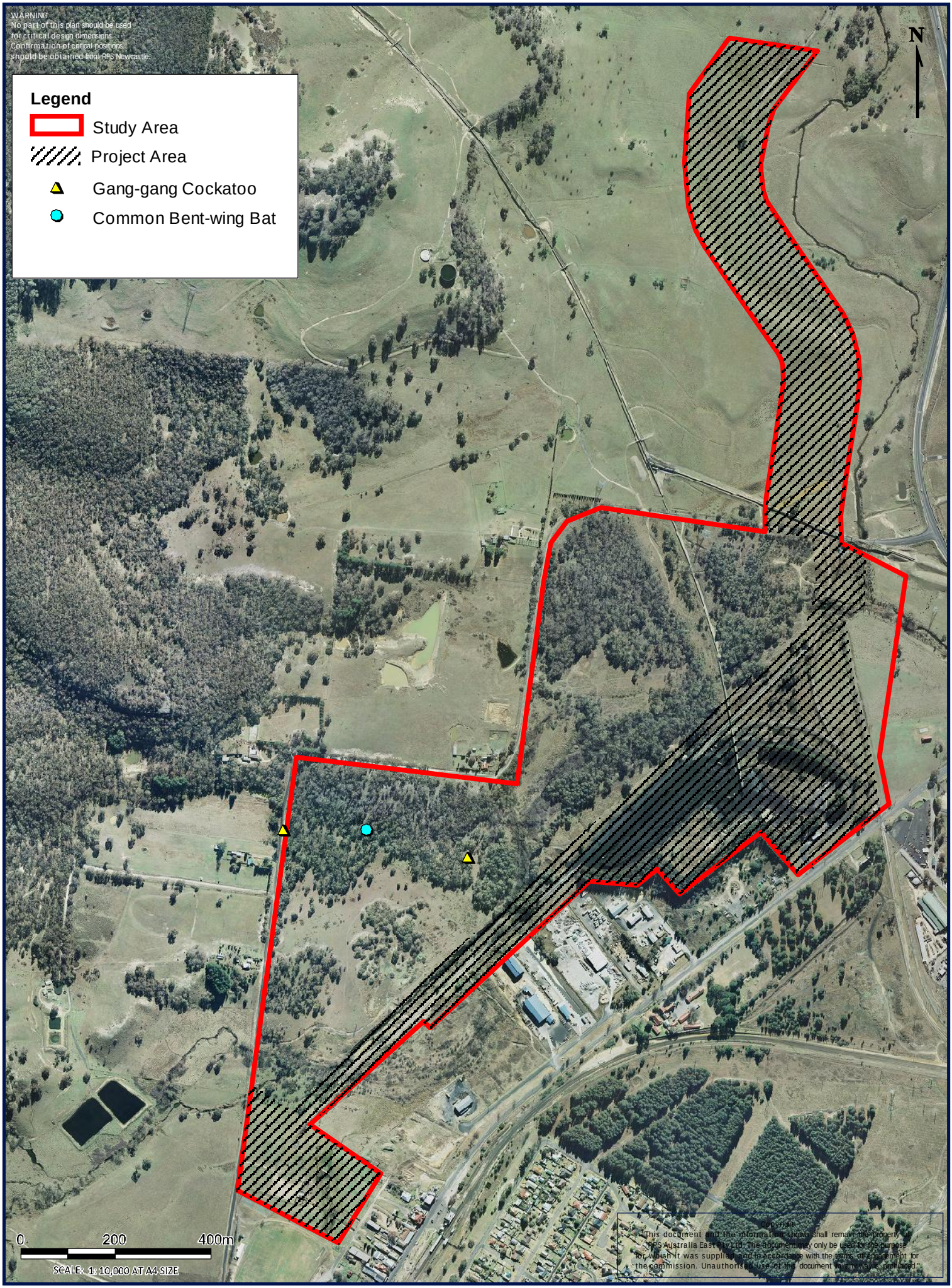
3.4.6 Herpetofauna

Six common reptilian species were recorded, including the Red Bellied Black Snake (*Pseudechis porphyriacus)*, Jacky Lizard (*Amphibolurus muricatus),* Blue-tongue Lizard (*Tiliqua scincoides*), Three-lined Skink (*Acritoscincus duperreyi*), Garden Sun Skink (*Lampropholis delicata*) and Weasel Skink (*Saproscincus mustelina*).

A total of nine species of amphibian were identified within the site. Several common species were recorded including the Bleating Tree Frog (*Litoria dentata*), Peron's Tree Frog (*Litoria peronii*), Verreaux's Frog (*Litoria verreauxii*), Smooth Toadlet (*Uperoleia laevigata*), Dusky Toadlet (*Uperoleia fusca*), Eastern Banjo Frog (*Lymnodynastes dumerilli*), Striped Marsh Frog (*Lymnodynastes peronii*), Spotted Grass Frog (*Lymnodynastes tasmaniensis*) and Common Eastern Froglet (*Crinia signifera*).

3.5 Secondary and Incidental Observations

During fauna surveys macropod and wombat scats were evident, in addition some scratches on tree trunks were observed. The tree trunk scratches were most likely attributable to those arboreal mammals recorded during spotlighting surveys (see **Section 3.4.3**). No other secondary indications or incidental observations of note occurred.



TITLE: FIGURE 3-4: LOCATIONS OF THREATENED FAUNA SPECIES

LOCATION: LIDSDALE SIDING

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 14/08/2012
PURPOSE: REPORT FIGURE

LAYOUT REF: 105704 Neubecks-Blackmans Flat\10- Drafting\Lidsdale Sidings
VERSION (PLAN BY): B A4 (PH-NW)

CLIENT: CENTENNIAL COAL
JOB REF: 105704

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

4 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 gazetted and recorded within a 10km radius of the site have been considered within this assessment. Endangered Ecological Communities (EECs) known from the broader area have also been addressed. Each species/community is considered for its potential to occur on the site and the likely level of impact as a result of the proposal. This assessment deals with each species/community separately and identifies the ecological parameters of significance associated with the proposal.

Those species/communities that have been identified as having potential to be impacted by the proposal have been subject to further assessment and comment in Section 6 and Section 8.

This assessment deals with the following heads of consideration in tabulated form (refer to **Table 4-1** overleaf):

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

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

'Likelihood of Occurrence on Site' – Assesses the likelihood of each species/community to occur on or within the immediate vicinity of the site 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 NPWS Atlas of NSW Wildlife, herbariums, NSW Bird Atlas etc.) and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

'Potential for Impact – Assesses the likelihood that impacts to each species/community would result from the proposed development, taking into account direct and indirect short and long-term impacts.

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			
Asterolasia elegans (E*)	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Known from only seven populations, only one of which is wholly within a conservation reserve. Occurs on Hawkesbury sandstone.	This species was not recorded on site during field surveys. This species has a limited distribution none of its preferred habitat, namely Hawkesbury sandstone occurs within the study area, it is therefore considered **unlikely** to occur.	Due to this species being unlikely to occur, it is considered **unlikely** to be impacted upon by this proposal.
Boronia deanei 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.	10km No areas of wet heath were observed within the study area and this conspicuous species was not recorded. It is therefore considered **unlikely** to occur.	Due to this species being unlikely to occur, it is considered **unlikely** to be impacted upon by this proposal.
Derwentia blakelyi (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. RPS has recently recorded a population within Ben Bullen State Forest, approximately 7km north of the study area.	This species was not recorded on site, however is known to occur within the locality. This species is conspicuous and readily identifiable in the field, however none were located within the study area despite targeted surveys. It is therefore considered **unlikely** to occur.	Due to this species being unlikely to occur, it is considered **unlikely** to be impacted upon by this proposal.
Eucalyptus aggregata 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.	This species was **recorded** during targeted surveys and occurs throughout the site, in particular within Black Gum/ Black Sally Grassy Open Forest and as isolated 'paddock trees'. Thus this species is known to occur on the site.	37 individual *E. aggregata* trees have been recorded within the proposed project area, however very few are within the potential footprint. There is therefore **potential** for a minor impact as a result of this proposal. A 7-part test of significance (TSC Act) has been applied to this species in **Section 5**.
Eucalyptus cannonii Capertee Stringybark (V, V*)	The altitude range of *Eucalyptus cannonii* is from about 460 m to 1040 m. Within the range, the species appears to tolerate most situations except the valley floors. Recorded from Tablelands Grassy Woodland Complex communities and Talus Slope Woodland, and in Winburndale Nature Reserve within woodland dominated by Red Stringybark (*E. macrorhyncha*) and Long-leaved Box (*E. goniocalyx*). Produces white flowers from January to April. The seed is spread by wind or gravity, generally in close proximity (within 30 m) to the parent plant; no dormancy mechanism. Associated species are similarly diverse: *E. viminalis, E. mannifera, E. polyanthemos, E. rossii, E. blakelyi, E. oblonga, E. sparsifolia, E. bridgesiana, E. dalrympleana, E. melliodora, E. dives* and *Angophora floribunda*.	This species was not detected during targeted field surveys. However, this species has been recorded within a 10km radius of the site. Suitable habitat within the vicinity of the site (Grassy Woodland) is structurally suitable for this species and *E. macrorhyncha* (a co occurring species of *E. cannonii*) also occurs on the site. Targeted surveys failed to locate the species on the site, however, due to its close relation to *E. macrorhyncha*, being distinguishable by fruit shape only, its presence on the site cannot be completely discounted. It may **potentially** occur within the site.	No Stringybark trees that could potentially be *E. cannonii* were recorded within the project area, it is therefore considered **unlikely** that this species will be impacted on by this development.
Eucalyptus pulverulenta Silver-leafed Gum (V, V*)	Grows in shallow soils as an understorey plant in open forest, typically dominated by Brittle Gum (*Eucalyptus mannifera*), Red Stringybark (*E. macrorhyncha*), Broad-leafed Peppermint (*E. dives*), Silvertop Ash (*E. sieberi*) and Apple Box (*E. bridgesiana*). Often occurs on granite substrates.	This species was not detected during targeted field surveys, however suitable10km habitat occurs within the study area. Therefore, It has **potential** to occur on site.	Whilst this species has the potential to occur within the study area, the habitats within the project area are predominately cleared / modified and no specimens were recorded therein. Therefore, it is considered **unlikely** to be impacted on by this development.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Euphrasia arguta (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. Also, this species has not been previously detected within 10km of the site. Therefore, it is **unlikely** to occur within the site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Genoplesium superbum 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 – September to March.	This species was not detected during targeted field surveys. Although the species has been recorded within the locality, no wet heath habitat occurs on site. Therefore, it is **unlikely** to occur within the site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Persoonia hindii (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.	This species was not recorded on site, however is known to occur within the locality. This species is conspicuous and readily identifiable in the field, however none were located within the study area despite targeted surveys. It is therefore considered **unlikely** to occur.	It is unlikely that this species occurs on site, therefore it is considered **unlikely** to be impacted by the proposed upgrade.
Prasophyllum sp. *Wybong* (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 10km of the site. Therefore, it is **unlikely** to occur within the site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Pultenaea glabra 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, hillslopes, gullies and creekbanks 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 and is outside its known distribution. Therefore, it is **unlikely** to occur within the site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Thesium australe Austral Toadflax (V, V*)	Grows in grassland or woodland, often in damp sites in association with Kangaroo Grass (*Themeda australis*).	This species was not detected during targeted field surveys on the site despite intensive surveys in suitable habitat, aimed to specifically locate it on site. Suitable habitat occurs for the species within the grassy understorey that characterises much of the southern parts of the study area, particularly where *Themeda australis* occurs. Therefore it may **potentially** occur on the site. However, habitat within the project area was found to be heavily disturbed and pasture improved and is unlikely to occur therein.	As this species has a low likelihood of occurring on the project area, it is considered **unlikely** to be impacted on by this development.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Herpetofauna			
Eulamprus leuraensis 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.	Although this species has been recorded within the wider locality of the site, this species was not observed during targeted filed surveys. Suitable habitat (Shrubby Swamps) is not present on the site. Therefore it is considered **unlikely** that this species occurs.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Heleioporus australiacus Giant Burrowing Frog (V, V*)	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, M. 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 and is associated with sandstone vegetation communities. The western distribution is considered to be Newnes State Forest, to the east of the study area. Subsequently the species is considered **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Hoplocephalus bungaroides 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 study area. Therefore, it is **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Litoria booroolongensis 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. Although stream-side habitat in the south of the study area has some suitable shelter, stream-side rocky or cobble bank habitats favoured by this species are not present. Therefore, it is **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Litoria littlejohni 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 *Litoria littlejohni*. 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.	No records occur of this species in the Lithgow area. Although this species is known to occur in open woodland habitat due to the absence of records from the study area, it is considered **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Mixophyes balbus 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. No rainforest streamside habitat occurs in the study area. Therefore, this species is **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Insects			
Paralucia spinifera Bathurst Copper Butterfly (E, V*)	A small sized butterfly with a wingspan of 20–30mm, 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 south-west to north-west aspect, usually where direct sunlight reaches the habitat, and with extremes of cold such as regular winter snowfalls or heavy frosts. Its lifecycle relies on a mutualistic relationship with the ant, Anonychomyra itinerans, and on the presence of B. spinosa subsp. lasiophylla which is used as the larval food	This species was not observed within the study area. A small area of the preferred larval feed plant of this butterfly, *Bursaria spinosa* (Native Blackthorn) occurs within the study area. Therefore the species **potentially** occurs.	Due to the retention of the entire *B. spinosa* habitat on the site, it is considered **unlikely** that this species will be impacted upon by the proposal.
Petalura gigantea Giant Dragonfly (E)	*Petalura gigantea* 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.	This species prefers swamps and bogs as its preferred habitat. No swamps or bogs occur within the study area, therefore it is considered **unlikely** that this species occurs.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Avifauna			
Anthochaera phrygia 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 *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* ssp. when westerly habitats are experiencing extended dry periods. As such this species may occur on the study site as a migratory visitor. Therefore, this species could **potentially** occur within the site.	Although there is limited opportunity for species to occur within the site, the proposed level of vegetation removal is **unlikely** to affect a significant area of potential habitat.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Lathamus discolor Swift Parrot (E*)	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*.	This species was not recorded on site during field surveys. No preferred feed trees for this species occur on site, and breeding only occurs in Tasmania. Therefore it is considered **unlikely** to occur on site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Leipoa ocellata Malleefowl (V*)	The stronghold for this species in NSW is the mallee in the south west centred on Mallee Cliffs NP and extending east to near Balranald and scattered records as far north as Mungo NP. Occasional records have been made in the Pilliga forests (most recently 1999), around Cobar (1991) and Goulburn River NP (1989). Predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 - 450 mm mean annual rainfall) areas. Less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey, or in other woodlands such dominated by Mulga or native Cypress Pine species. Prefers areas of light sandy to sandy loam soils and habitats with a dense but discontinuous canopy and dense and diverse shrub and herb layers.	This species was not recorded on site. Habitat that consists of dense, high diversity understorey does not exist on site. No records exist within the wider locality. Therefore it is **unlikely** to occur on site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Rostratula australis Australian Painted Snipe (V*)	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowal, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	This species was not recorded on site during field surveys. Suitable aquatic habitats in the form of swamps and dams do not occur on site. Therefore it is considered **unlikely** to occur on site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Callocephalon fimbriatum 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.	This species was **recorded** on site.	Due to this species being recorded on site there is **potential** for impact on this species habitat. A 7-part test of significance (TSC Act) has been applied to this species in **Section 5**.
Calyptorhynchus lathami Glossy Black-Cockatoo (V)	Occurs in forests and woodlands where it forages predominantly on *Allocasuarina* cones, particularly those of *A. littoralis*, *A. torulosa* and at time *A. distyla*. 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, *Allocasuarina* species (*A. littoralis*, *A. torulosa* and/or *A. distyla*), were observed within the site and there are limited hollow-bearing trees to represent breeding opportunities for this species. Therefore the study area is **unlikely** to represent suitable habitat for this species.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Chthonicola sagittata 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, it is possible that this species utilises the site occasionally. It is therefore **likely** to occur within the site.	Suitable habitat for this species occurs on site and with the removal of minor vegetation, albeit mostly non-native, may have **potential** for minor impacts upon habitat for this species. A 7-part test of significance (TSC Act) has therefore been applied to this species in **Section 5.**

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Climacteris picumnus victoriae 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 200ha. A number of records exist on the Newnes Plateau to the northwest of the sites (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 area and potential habitat occurs on site. Therefore, this species is **likely** to occur within the site.	Suitable habitat for this species occurs on site and with the removal of minor vegetation, albeit mostly non-native, may have **potential** for minor impacts upon habitat for this species. A 7-part test of significance (TSC Act) has therefore been applied to this species in **Section 5.**
Daphoenositta chrysoptera 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.	This species was not detected during targeted field surveys. However there are previous records in the study area and the presence of rough barked trees on the study site suggests that the species may be an occasional visitor to the site. Therefore this species is **likely** to occur within the site.	Suitable habitat for this species occurs on site and with the removal of minor vegetation, albeit mostly non-native, may have **potential** for minor impacts upon habitat for this species. A 7-part test of significance (TSC Act) has therefore been applied to this species in **Section 5.**
Heiraaetus morphonoides 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 site during fieldwork. Although this species is known to occur in open eucalypt forest, woodland or open woodland there are no records for this species from the Newnes Plateau and Lithgow area. Therefore the proposed works area is **unlikely** to represent suitable habitat for this species.	As this species has a large home range and the low level of vegetation clearance on the site, it is considered **unlikely** that this species is to be impacted on by this development.
Melanodryas cucullata 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 100-200ha.	This species was not recorded within the site during fieldwork. This species is generally a western woodland species, occurring in open woodlands with a diverse understorey. The species has a defined home range of up to 30 hectares, thus the study area's small size may make it unsuitable habitat. Therefore the study area is **unlikely** to represent suitable habitat for the species.	Although there is limited opportunity for species to occur within the site, the proposal is **unlikely** to affect a significant area of potential habitat.
Melithreptus gularis gularis 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 et al, 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 site during fieldwork. A woodland / open forest bird, this species may sparsely occur in areas where habitat structural diversity is high. The habitat within the site is not considered to offer sufficient structural diversity to suit this species and also does not contain the preferred forest types. Therefore the proposed works area is **unlikely** to represent suitable habitat for this species.	Although there is limited opportunity for species to occur within the site, the proposal is **unlikely** to affect a significant area of potential habitat.
Ninox connivens 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 *Acacia* sp. and *Casuarina* 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 site during fieldwork. This species is generally western species, individuals are occasionally recorded in more easterly habitat, particularly those areas characterised by large expanses of wooded habitat. The species has a large home range and subsequently may occupy the site on an intermittent basis. Therefore the proposed works area is **likely** to represent suitable habitat for this species.	Due to the large home range of the species and the localised nature of clearance activities, it is **unlikely** that this species will be adversely affected by the proposal.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Ninox strenua 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.	This species was not recorded within the site during fieldwork. It is likely that the site occurs within the foraging range and perhaps the breeding territory of locally occurring Powerful Owls. Therefore, this species could **potentially** occur within the site.	Although this species potentially occurs within the site, a general paucity of large hollows places limitation on breeding opportunities within the site's vicinity. Therefore, the proposal is **unlikely** to affect a significant area of potential habitat.
Petroica boodang 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 not recorded on the site during fieldwork. It is found in woodlands throughout a range of habitats. It is found throughout the Blue Mountains region, thus this species could **potentially** occur within the study area.	The proposal is likely to modify only a small proportion of the habitat in the study area. Therefore, this species is **unlikely** to be significantly impacted upon by this development.
Petroica phoenicea 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 not recorded on the site during fieldwork. It is found in woodlands throughout a range of habitats. It is found throughout the Blue Mountains region, thus this species could **potentially** occur within the study area.	The proposal is likely to modify only a small proportion of the habitat in the study area. Therefore, this species is **unlikely** to be significantly impacted upon by this development.
Stagonopleura guttata Diamond Firetail (V)	Occupies open woodlands / forests and associated habitats with grassy understorey. Generally found west of the Divide or in drier semi-coastal areas such as the upper Hunter Valley. Appears unable to persist in remnants less than 200ha. A small number of records exist from the Lower Hunter Region (HBOC, Atlas of NSW Wildlife data 2009).	This species was not recorded within the site during fieldwork. Generally a western species, occurring in open woodlands with grassy understorey strata, similar to that occurring on the site. It is likely that the species may **potentially** occur within the study area.	The proposal is likely to modify only a small proportion of the habitat in the study area. Therefore, this species is **unlikely** to be significantly impacted upon by this development.
Grantiella picta Painted Honeyeater (V)	This is a nomadic species that occurs in highest densities around the inland slopes of the Great Dividing Range. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias.	Comprehensive surveys have not recorded mistletoe on Eucalypt species throughout the site. In the absence of their core diet, it is **unlikely** that they would occur on site.	Due to this species being unlikely to occur on site, it is considered **unlikely** to be impacted upon by this proposal.
MAMMALS			
Falsistrellus tasmaniensis 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 not recorded during Anabat surveys by RPS. Suitable habitat does occur in the area. Therefore, this species has potential to occur within the site.	The proposal is likely to modify only a small proportion of the habitat in the study area. Therefore, this species is **unlikely** to be significantly impacted upon by this development.
Scoteanax rueppellii 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 site 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 site on at least an intermittent basis.	The proposal is likely to modify only a small proportion of the habitat in the study area. Therefore, this species is **unlikely** to be significantly impacted upon by this development.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Nyctophilus timoriensis (SE form) Greater Long-eared Bat (V, V*)	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, Bulloke *Allocasuarina leuhmanni* and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	This species was not recorded within the site 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 site on at least an intermittent basis.	The proposal is likely to modify only a small proportion of the habitat in the study area. Therefore, this species is **unlikely** to be significantly impacted upon by this development.
Miniopterus schreibersii subsp. *oceanensis* 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. Often found roosting with *Miniopterus schreibersii* (Eastern Bentwing-bat).	This species was recorded during Anabat surveys by RPS. Therefore, this species is **likely** to occur within the site.	The proposal is likely to modify only a small proportion of the habitat in the study area. Therefore, this species is **unlikely** to be significantly impacted upon by this development.
Chalinolobus dwyeri 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 not recorded during Anabat surveys by RPS however suitable habitat does exist on site for this species. Therefore, this species has **potential** to occur within the site.	Although this species is likely to occur on site, the amount of suitable roosting habitat to be removed is small and is **unlikely** to have a significant impact on this species.
Dasyurus maculatus 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 (Atlas of NSW Wildlife data). It is an opportunistic hunter of a variety of prey.	This species was not recorded within the site during fieldwork. However this species has been recorded within the broader area. However, as suitable habitat occurs within the site, it has the **potential** to occur within the site.	Although this species has some potential to be an infrequent visitor to the site, the amount of suitable roosting habitat to be removed is small and is **unlikely** to have a significant impact on this species.
Petaurus norfolcensis 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.	This species was not recorded within the site during fieldwork, however the Sugar Glider, a species with a similar ecological niche was recorded. Due to the presence of hollow bearing trees on the site, the species has the **potential** to occur within the site.	Although this species is likely to occur on site, the amount of suitable roosting habitat to be removed is small and is **unlikely** to have a significant impact on this species.
Phascolarctos cinereus Koala (V, V*)	Occurs in forests and woodlands where it requires suitable feed trees (particular *Eucalyptus* spp.) and habitat linkages. Will occasionally cross open areas, although it becomes more vulnerable to predator attack and road mortality during these excursions. Records from the Upper Hunter are largely confined to substantial woodland and forest habitat within reserves.	This species was not recorded within the site during fieldwork. It is known from the broad locality. Therefore, this species could **potentially** occur within the site.	Although this species is likely to occur on site, the amount of suitable roosting habitat to be removed is small and is **unlikely** to have a significant impact on this species.
Pseudomys fumeus Smoky Mouse (E*)	Currently limited to a small number of sites in south-eastern NSW. There are few records existing in NSW for this species, ranging from Kosciuszko National Park, Bondo and Ingbyra State Forests, Mt Poole, Nullica State Forest and the adjoining S. E. Forests National Park. Prefers heath habitat on ridge top communities and slopes in sclerophyll forest, heathland and open forest. Can also occur in fern gullies.	This species was not recorded on site during field surveys and has not been recorded within the local area. The ridgetop and sloping habitats preferred by this species are not present on site. Therefore, this species is unlikely to occur on site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Pseudomys novaehollandiae New Holland Mouse (V*)	This species has a clumped distribution throughout Australia. It has been found at coastal areas to up to 100km inland on sandstone habitats. Requires deep soils for digging burrows. Across their range they are known from open heathland, open woodland with a heathland understorey and vegetated sand dunes. Also prefer communities high in species diversity as their diet requires a high amount of legumes.	Sandstone habitats, heathland and communities with a well vegetated understorey do not occur on site. Depth of soil is likely to be adequate however the communities on site are relatively low in floristic diversity. The required habitat attributes required by this species do not persist on site; therefore it is **unlikely** to occur on site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Pteropus poliocephalus 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 during field surveys. Food trees are present on site and when in flower could provide as a foraging source for this species. There is **potential** for this species to occur on site.	Despite the potential for this species to occur on site, no prime habitat is being removed as a result of the proposal and due to this species ability to migrate large distances between foraging sites it is considered **unlikely** to be impacted upon by the proposal.
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) (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 *Isoodon macrourus* (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 during field surveys. Suitable habitat in the form of rainforest, wet sclerophyll and heathlands do not occur on site. Shrub layers with sufficient vegetation for nesting and protection are also minimal on site. It is therefore **unlikely** to occur on site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Petrogale penicillata Brush-tailed Rock-wallaby (V*)	An agile inhabitant of rocky slopes of south-eastern Queensland and northern NSW with remnant populations in Victoria and western NSW. The sites occupied by *P. penicillata* mostly have a northerly aspect, so as to allow the animals to sun themselves in the early morning and late afternoon.	No suitable habitat in the form of rocky slopes is located on site. Therefore it is considered **unlikely** to occur on site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Fish			
Maccullochella peelii peelii Murray Cod (V*)	Found extensively throughout the Murray Darling Basin in the south-eastern region of Australia. It is the largest freshwater fish in Australia, growing up to 1.8m in length.	This species was not recorded on site, and suitable rivers large enough to accommodate this species do not occur on site. Therefore it is considered **unlikely** to occur on site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Macquaria australasica Macquarie Perch (E*)	Occurs throughout the Murray Darling River System. This schooling species of fish prefers habitats with deep, clear water, dense vegetation and rocky bottoms. Overhanging vegetation also provides protection for this species.	This species was not recorded on site. The creek on site does not have adequate water depth and clarity in which this species prefers. Therefore it is considered **unlikely** to occur on site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Prototroctes maraena Australian Grayling (V*)	On mainland Australia, this species has been recorded from rivers flowing E and S of the main dividing ranges. It is absent from the inland Murray-Darling system. Prefers clear water with gravel bottoms.	This species was not recorded on site during field surveys. The creek on site does not provide adequate conditions suitable for this species in terms of bottom substrate and water clarity. Therefore it is **unlikely** to occur on site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Threatened Ecological Communities			
Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion (E) 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 metres. Newnes Plateau shrub swamp has a greater dominance of shrubs when compared to Blue Mountains Sedge Swamps.	Vegetation mapping has occurred throughout the study area and no vegetation communities commensurate with this community were recorded. It is therefore **unlikely** that this community occurs in the study area.	Due to not being recorded in the study area, the proposal is un**likely** to have a significant impact on this species.
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) 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 *Sphagnum* spp., the hummock peat-forming mosses. This community is known to occur within the Lithgow LGA.	Vegetation mapping has occurred throughout the study area and no vegetation communities commensurate with this community were recorded. It is therefore **unlikely** that this community occurs in the study area.	Due to not being recorded in the study area, the proposal is un**likely** to have a significant impact on this species.
White Box – Yellow Box – Blakeley's Red Gum Grassy Woodland and derived native Grassland (E, CE*)	This community is dominated by *Eucalyptus albens, E. melliodora* and *E. blakelyi* 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 site. Therefore, it is considered **unlikely** to occur within the site.	Due to the low likelihood of occurrence within the site, it is considered that this vegetation community is **unlikely** to be impacted on by the proposal.
Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland (E)	This community is dominated by Snow Gum/ Black Sally/ Candlebark and/ or Ribbon Gum throughout the Central West NSW at higher altitudes. The forest and woodland of this community is usually grassy with a sparse native understorey.	The community mapped as MU15 (after DEC 2006) was **recorded** on site. This community is commensurate with this EEC. It is therefore known that this EEC occurs on the site.	Approximately 0.25ha of this EEC occurs within the project area and therefore has the **potential** to be impacted upon as part of the proposal. A 7-part test of significance (TSC Act) has been applied to this species in **Section 5.**

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 listed under the *Commonwealth EPBC Act 1999*.
(CE*) = Critically Endangered Species listed under the *Commonwealth EPBC Act 1999*.

TSC Act Assessment of Significance (7-Part Test)

For those species in **Table 4-1** that are considered as having potential to be impacted by the proposed upgrade, a 7-part test of significance has been applied to determine in detail the potential of the impact.

Threatened Flora and Fauna

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

Threatened Flora

- *Eucalyptus aggregata* (Black Gum)

Approximately 14.2ha of suitable occupied habitat has been mapped within the study area. The study area's population is generally isolated from commensurate areas of suitable low-lying habitat separated by cleared land. Therefore, for the purpose of this assessment, the population within study area is considered a local population.

37 individual *E. aggregata* trees occur within the proposed project area, however very few of these are mapped within close proximity to the actual development footprint. This species is strongly associated with the Tableland Hollows Black Gum - Black Sally Open Forest community of which approximately 10.3ha occurs within the study area in good condition and approximately 3.9ha occurs in a degraded state.

Two of the 37 *E. aggregata* trees have been recorded within an area mapped as degraded Tableland Hollows Black Gum - Black Sally Open Forest, of which approximately 0.25ha occurs within the project area and may potentially be disturbed. The remaining 35 were recorded on cleared land alongside the rail line. These individuals include young regrowth specimens growing on top of an existing flood barrier. Given that the majority of occupied habitat (approximately 98%) occurs outside of the project area, it is considered that the proposal is unlikely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Threatened Fauna

- Woodland/Forest Birds
  - Gang-gang Cockatoo (*Calocephalum fimbriatum*)
  - Speckled Warbler (*Chthonicola sagittata)*
  - Brown Treecreeper (*Climacteris picumnus victoriae)*
  - Varied Sittella *(Daphoenositta chrysoptera)*

The Gang-gang Cockatoo was observed on site and suitable habitat exists for the remaining above species. The proposed upgrade may involve the removal of a small

number of scattered edge trees to maintain adequate clearance from the rail line. These could potentially be used for nesting and foraging by woodland birds. However due to the low number of individuals being removed and the vast availability of habitat in the immediate surrounds, it is unlikely that this will cause an impact to these species. Thus it is unlikely that the proposal will affect the life cycle of the above woodland/forest bird species such that a viable local population of the species is likely to be placed at risk of extinction.

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

No endangered populations are considered to have a potential of occurring within the study area.

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

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

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

- Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland

Approximately 15.7ha of Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland occurs within the study area. With the exception of a small area of this community immediately adjacent to the western boundary of the study area (DECC, 2006), this community is completely isolated from areas of commensurate habitat due to the presence of surrounding cleared lands. Therefore, for the purpose of this assessment, the local occurrence of this community is considered to be restricted to the study area.

Approximately 0.25ha of Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland occurs within the project area, however the majority of this occurs outside the actual proposed footprint. As far as practical, this vegetation community will be avoided during construction however there may be the need for trimming or some tree removal to allow safe clearance from the rail line. Given that the majority of the local occurrence of this EEC within the study area (approximately 98%) occurs outside of the project area, it is considered that the proposal is unlikely to have a substantial effect on the extent or composition of this community such that its local occurrence is likely to be placed at risk of extinction.

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

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

- *Eucalyptus aggregata* (Black Gum)

37 individual trees and approximately 0.25ha of occupied habitat occur within the project area and a portion of this may potentially be removed or modified by the proposal. However, avoidance of these ecological attributes will be prioritised wherever possible.

- Woodland/Forest Birds
  - Gang-gang Cockatoo (*Calocephalum fimbriatum*)
  - Speckled Warbler (*Chthonicola sagittata*)
  - Brown Treecreeper (*Climacteris picumnus victoriae*)
  - Varied Sittella (*Daphoenositta chrysoptera*)

A maximum of approximately 0.25ha of native vegetation and 0.44ha of non-native vegetation may potentially be removed or modified by the proposal, however the actual required amount to be removed is likelt to be considerably less.

- Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland

A maximum of approximately 0.25ha of this EEC may potentially be removed or modified by the proposal.

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

The project area occurs on the edge of an already extensively cleared area. Therefore no areas of habitat will become more fragmented or isolated to an extent greater than what already exists.

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

Given the larger areas of higher quality habitat immediately adjacent to the project area, the importance of the habitat that may be removed is considered to be low.

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

No areas of the study area are recognised as critical habitat.

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

Of the threatened species under consideration for this study area, none of the species had a recovery plan or threat abatement plan to assess whether the action proposed is consistent with the objectives or actions. Nevertheless, the proposed action is unlikely to greatly contravene any objectives or actions necessary to maintain the local population of these species.

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

The following KTP's are considered to be potentially associated with the Proposal:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- Clearing of Native Vegetation;
- Invasion of native plant communities by exotic perennial grasses; and
- Anthropogenic climate change.

These KTP's are give further consideration in Section 5. The proposed upgrade activities may involve the above KTP's however due to the low amount of habitats to be potentially affected, the impact is considered low and the possible impacts by these listed KTP's is likely to be insignificant.

5 Key Threatening Processes

Key Threatening Processes (KTPs) are listed under Schedule 3 of the TSC Act 1995. There are four KTPs that have the potential to affect the site as a consequence of the proposal, being:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- Anthropogenic climate change;
- Clearing of Native Vegetation; and
- Invasion of native plant communities by exotic perennial grasses.

"Alteration of the natural flow regimes of rivers, streams, floodplains and wetlands"
The adjacent creek could be affected by the proposal if mitigation measures are not implemented to ensure the safe storage of excess water flows from the site.

Monitoring of storage ponds is essential to ensure that the creek is not affected by the proposed works and that each pond is serving its purpose to hold excess water with no spills. The extent to which the proposal could contribute to this process is considered unlikely to be significant, as long as precautionary measures are implemented and monitored regularly.

"Anthropogenic Caused Climate Change"
The proposal is likely to contribute to the Key Threatening Process "Anthropogenic Caused Climate Change" as a result of clearing a small amount of native vegetation. The extent to which the proposal could contribute to this process is considered unlikely to be significant.

"Clearing of Native Vegetation"
The proposed upgrade will require the maximum removal of a relatively small area (0.25 ha) of native vegetation and as such will incrementally contribute to the Key Threatening Process "Clearing of Native Vegetation". This is a key threatening process for the Gang-gang Cockatoo, Speckled Warbler and *E. aggregata*. However, the extent to which the proposal could contribute to this process is considered unlikely to be significant.

"Invasion of native plant communities by exotic perennial grasses"
The proposed upgrade will involve the removal of a small amount of native vegetation which could result in the establishment of exotic perennial grasses in its absence. Speckled Warblers in particular are vulnerable to loss of native ground vegetation and the introduction of exotic grasses. However, the extent to which the proposal could contribute to this process is considered unlikely to be significant.

6 Additional Legislative Considerations

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

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

The subject site 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.

6.1.2 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".

One Schedule 2 feed tree species (Ribbon Gum) was recorded within the site at densities of less than 15% of the total number of trees, therefore the site does not constitute Potential Koala Habitat and no further provisions of this policy apply. Additionally, no Koalas or evidence of Koalas were recorded during surveys. 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.

6.2 Considerations under the *Environment Protection and Biodiversity Conservation Act 1999*

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

Commonwealth land

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

World Heritage Properties

The site is not a World Heritage Property. The Greater Blue Mountains Area of NSW (a World Heritage Property) is located approximately 20 km to the east of the subject site. It is expected that the proposal will not have a significant impact upon The Greater Blue Mountains Area of NSW.

National Heritage Places

The site is not a National Heritage Place. The Greater Blue Mountains Area of NSW (a National Heritage Place) is located approximately 20 km to the east of the subject site. It is expected that the proposal 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 10km of the site.

Nationally listed threatened species and ecological communities

A total of 31 threatened species and three ecological communities listed under the EPBC Act 1999 have been recorded or have suitable habitat within a 10km radius of the site (see **Table 4-1** for likelihood of occurrence of threatened species listed under EPBC Act 1999). This assessment concluded that the proposal is unlikely to have the potential affected EPBC Act listed threatened species, ecological communities or their habitats.

Nationally listed migratory species

A total of 15 migratory species listed under the EPBC Act 1999 have been recorded or have suitable habitat within a 10km radius of the site. The proposal 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 site.

The environment of Commonwealth marine areas

No Commonwealth marine areas exist within or adjacent to the site.

Summary Statement:

Based on the above, it is considered the current proposal will not impact on matters of NES. Therefore, a referral is not considered necessary as NES are not likely to be significantly impacted upon by the project.

7 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 proposal.

1. **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 proposal 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 removal of a maximum of approximately 0.25ha of regrowth native vegetation and approximately 1.95ha of non-native vegetation to accommodate essential surface facilities will result in a slight regional reduction in vegetation cover. However, given the expanse of the affected vegetation / habitat types in the broader locality, this is considered unlikely to lead to a realised reduction in biodiversity.

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 proposal 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.

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.**

37 individual *E. aggregata* trees occur within the proposed project area, however very few of these are mapped within close proximity to the actual development footprint. This species is strongly associated with the Tableland Hollows Black Gum - Black Sally Open Forest community of which approximately 10.3ha occurs within the study area in good condition and approximately 3.9ha occurs in a degraded state.

Two of the 37 *E. aggregata* trees have been recorded within an area mapped as degraded Tableland Hollows Black Gum - Black Sally Open Forest, of which approximately 0.25ha occurs within the project area, of which a portion may potentially be disturbed. The remaining 35 were recorded on cleared land alongside the rail line. These individuals include young regrowth specimens growing on top of an existing flood barrier. The majority of occupied habitat (approximately 98%) for *E. aggregata* and the Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland EEC occurs outside of the project area and will not be affected.

The removal of the relatively small area of habitat for the proposal 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.

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

There is no declared “Critical Habitat” within the locality, and as such the proposal will not adversely affect any such habitat.

8 Cumulative Impacts

This section provides the additional information in relation to the potential cumulative impacts of projects in the locality. A comparative and cumulative assessment of the impacts of each project to date on threatened species and TEC's and the potential impacts predicted to occur as a result of the additional projects currently being considered are addressed herewith. Due to uncertainty about the environmental effects of some schemes and the lack of attainable information available for review, a broad identification of what the key effects might be is addressed in this section.

1. Coal Services Washery Upgrade and Coal Distribution Project;

This project involves an upgrade to the existing washery facility at Centennial Coal Services by constructing additional processing infrastructure. It also involves the construction of haul roads and additional conveyors to transport coal to nominated surrounding coal facilities.

Approximately 9ha of native vegetation and 6.5ha of planted rehabilitation area is proposed to be removed as a result of this project. Those threatened species with the potential to be impacted upon, include woodland birds and Capertee Stringybark.

2. Mount Piper power station including:

- Application for a Western Rail Coal Unloader (06_0271) approved in June 2009;
- Application for a new Base Load Power Station (MP 09_0119) approved in January 2010; and
- Application for the Ash Emplacement project under part 3A (MP 09_0186) not yet determined.

Delta Electricity received approval in June 2009 to construct a rail coal unloader facility north of Mt Piper and Wallerawang Power Stations, near Lithgow. The proposed facilities include a rail loop, connecting to the Mudgee rail line branch, a rail unloader and a conveyor to transport the coal to the power station.

SKM (2007) determined that approximately 2.5ha of remnant vegetation would require removal to allow the construction of the conveyor, however the placement of the conveyor within disturbed/regenerating areas would reduce the amount of clearing required. The vegetation communities to be affected by the conveyor were named in SKM (2007) as Ribbon Gum – Apple Box – Snow Gum Woodland, Brittle Gum – Scribbly Gum – Stringybark Woodland and Regenerating Vegetation. One threatened species was recorded by SKM, namely Capertee Stringybark. Up to 50 Capertee Stringybark individuals may be removed as a result of this development.

The 2.5ha of vegetation to be removed is considered to potentially affect woodland habitats, suitable for a number of woodland dependent fauna, including the threatened fauna species listed in **Section 5**.

3. Angus Place Mine

Angus Place is an existing underground longwall mining operation located in the NSW Western Coalfield, approximately 120 km west-northwest of Sydney. In 2010 Angus Place sought to modify its existing NSW Part 3A Project Approval under Section 75 W of the NSW Environmental Planning and Assessment Act 1979 (**EP&A Act**), which included the addition of two longwall panels, 910 (Options 1 and 2) and 900 W. Angus Place also referred this project to the Department of Sustainability, Environment, Water, Population and Communities (SEWPAC). Approval under the NSW EP&A Act for the two longwalls was granted on 29 August 2011. Preliminary documentation has been produced by RPS for the proposed longwalls 910 and 900W, following a controlled action decision by SEWPAC under the EPBC Act.

The main potential impacts to local ecology as a result of the proposed longwalls are from potential changes in surface and groundwater hydrology as a result of mine subsidence and horizontal surface cracking. Those ecological communities and species and that may be affected include groundwater dependent ecosystems, including the hanging swamps and shrub swamp communities and flora and fauna species dependent on those habitats, including Deane's Boronia and the Blue Mountains Water Skink. Those rare habitats and species that may potentially be affected by the proposed Angus Place longwall panels considered unlikely to occur within the Lidsdale study area. Given that the Angus Place project does not occur in similar ecological environs to the project, the project will not cumulatively impact ecological characteristics relevant to those operations.

4. Springvale Mine including longwalls 415 to 417

Springvale Coal is a joint venture company owned in equal share by Centennial Springvale Pty Ltd (a wholly owned subsidiary of Banpu Minerals Ltd), and Springvale SK Kores Pty Limited. In 1992, Springvale Coal obtained Development Consent to produce up to 3.4 million tonnes per annum (Mtpa) of Run of Mine (ROM) coal, and longwall mining commenced in 1995.

Springvale Coal was required to obtain an approved Subsidence Management Plan (SMP) in place prior to the commencement of mining. In 2006, Springvale Coal obtained SMP Approval to extract LWs 411 to 418. Springvale Coal has now sought to obtain approval under the EPBC Act for the proposed LW's 415 to 417. LW's 415 to 417 are located beneath the Newnes State Forest north of Lithgow. Preliminary documentation has been produced by RPS for the proposed longwalls 415 and 417, following a controlled action decision by SEWPAC under the EPBC Act.

The main potential impacts to local ecology as a result of the proposed longwalls are from potential changes in surface and groundwater hydrology as a result of mine subsidence and horizontal surface cracking. Those ecological communities and species and that may be affected include groundwater dependent ecosystems, including the hanging swamps and shrub swamp communities and flora and fauna species dependent on those habitats, including Deane's Boronia and the Blue Mountains Water Skink. Those rare habitats and species that may potentially be affected by the proposed Springvale longwall panels

considered unlikely to occur within the Lidsdale study area. Given that the Springvale project does not occur in similar ecological environs to the Lidsdale site, the project will not cumulatively impact ecological characteristics relevant to those operations.

5. A Part 3A application (10_0041) for an open cut mining extension to the Pine Dale Coal Mine (Yarraboldy Extension);

Pine Dale Coal Mine Stage 2 Extension project aims to extend the original Pine Dale Coal Mine (approximately 82ha) and Yarraboldy Extension Area (approximately 27ha) by approximately 210ha. The proponents of the proposal include:

- Crushing, stockpiling and maintenance area;
- Office, amenities and parking area;
- Railway line, spur and rail load-out area;
- Internal access roads and private haul road crossing; and
- Explosive magazine and/or reload area.

Approximately 210ha of state forest vegetation is required to be removed for this project, comprising three vegetation types, namely:

- Stringybark (*Eucalyptus sparsifolia*, *E. macrorhyncha*) – Scribbly Gum (*E. rossii*) Forest, Rocky;
- Outcrop Complex;
- Mountain Gum (*Eucalyptus dalrympleana*) Forest; and
- Open Cleared Lowlands.

Survey work has identified the NSW listed Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South eastern Slopes Bioregions EEC is present with the Stage 2 Extension Area. In addition, one threatened flora species, namely *T. australe* has been recorded within the Stage 2 Extension Area. Austral toadflax is listed as Vulnerable under the TSC Act and EPBC Act. A total of 99 individual of *T. australe* plants from 26 survey plots were recorded by Eco Logical Australia. The Stage 1 extension area was modified to retain the recorded *T. australe* population, however Stage 2 has sought to provide a provisional exclusion area to provide for the development of an offset strategy targeting this species (R.W. Corkery & Co., 2011). There is therefore potential for this local population to be impacted upon if appropriate offsets cannot be found.

The Pine Dale extension will remove habitat for a number of threatened fauna. In particular it is recognised as habitat for listed forest and woodland birds, with Scarlet Robin and Gang-gang Cockatoo being recorded within the Stage 1 area (Ecotone Ecological Consultants, 2010) and Scarlet Robin, Varied Sitella and White-bellied eagle being recorded during surveys for the Stage 2 area (R.W. Corkery & Co., 2011). Habitat for several other locally occurring threatened species are also recognised within the extension area. The Pindale extension area also provides habitat for Squirrel Glider,

which was potentially recorded, however the sighting could not be confidently identified as this species by Ecotone Ecological Consultants. In addition, the site provides habitat for microchiropteran bat species, with three threatened bat species being potentially recorded with a 'probable' or 'possible' level of confidence, namely Eastern Bent-wing Bat, Eastern Cave Bat, Large-eared Pied Bat and Yellow-bellied Sheath-tailed Bat (Ecotone Ecological Consultants, 2010). The Purple copper butterfly was recorded in several patches of its larval food plant, *Bursaria spinosa lasiophylla*, near (outside) the eastern boundary of the Pinedale extension area during surveys by Ecotone Ecological Consultants in 2009. No areas of this critical habitat resource were recorded within the proposed extension area.

With consideration of the loss of communities, species and habitat of the Pinedale Mine extension and the proposed Lidsdale upgrade, cumulative effects of both projects are expected to occur for the EEC Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland, habitat for *T. australe* and habitat for threatened fauna species, being predominantly woodland birds, Squirrel Glider and microchiropteran bats.

6. Additional developments:

- Wallerawang power station including approval for a Development Application (024/11DA) in July 2011 for new storage silos;
- Blackmans Flat Waste Management Facility; and
- Western Matrix Mobile Resource Recovery Mill (011/11DA).

The combined impact of these projects within the surrounding locale contribute to the ecological pressures placed on threatened flora and fauna species and endangered ecological communities within the area.

9 Conclusion and Recommendations

9.1 Conclusion

The proposal may potentially remove a small portion of the existing approximately 0.25 ha of native vegetation in order to provide infrastructure associated with the proposed upgrade mainly associated with the track work and additional shunt.

The proposed upgrade has been designed based on minimum impact to significant surface features. After due consideration against the relevant key thresholds assessment criteria as set out within Draft Guidelines for Threatened Species Assessment for Part 3A Applications (DEC / DPI 2005), the proposal is expected to have minimal impacts on the ecology of the site.

The proposed direct surface impacts may result in the removal of up to 37 individual *E. aggregata* trees. However, due to the siting of the prioposed infrasturcture within the project area, the actual number to be removed is likely to be consederably less. Large numbers of *E. aggregata* specimens occur adjacent to the project area, within superior habitat. It is therefore considered that the proposed development is not likely to have an adverse effect on the local population of this species such that a viable local population is likely to be placed at risk of extinction.

9.2 Mitigation Measures

The following mitigation measures have been recommended to minimise potential impacts of the proposal:

- The minimum amount of clearing should take place as a general objective of the project, particularly within those areas that contain *E. aggregata*;
- Measures should be implemented to avoid impacts upon waterways and associated vegetation resulting from soil disturbance, namely adequate erosion and sedimentation controls with regular monitoring to ensure their functionality and condition;
- Appropriate measures should be employed to ensure that machinery working within the site does not bring materials (soils etc.) onto the sites that may infect onsite vegetation with Phytophthora cinnamomi; and
- Ongoing weed monitoring should be instituted and potential weed infestations be appropriately managed to ensure surrounding communities are protected from invasive species.

10 References

Briggs, J. D. and Leigh, J. H. (1996). *Rare or Threatened Australian Plants*. CSIRO, Collingwood, Victoria.

Christidis, L. and Boles, W. (1994). The Taxonomy and Species of Birds of Australia and Its Territories, Royal Australasian Ornithologists Union, Melbourne.

Churchill, S. (1998). Australian Bats. Reed New Holland Publishers, Sydney, Australia.

Cogger, H.G. (1996). Reptiles and Amphibians of Australia. Fifth edition. Reed International, Chatswood, N.S.W.

Cropper, S. (1993). *Management of Endangered Plants*. CSIRO Publications, East Melbourne, Victoria.

Debus, S.J.S. (1995). *Surveys of large forest owls in Northern New South Wales; methodology, calling behaviour and owl responses*. Corella, 19:38-50.

DEC (2000). Anthropogenic climate change, key threatening process listing, DEC, Sydney.

DEC (2001). Clearing of native vegetation, key threatening process listing, DEC, Sydney.

DEC (2003). Infection of native plants by *Phytophthora cinnamomi*, key threatening process listing, DEC, Sydney.

DEC (2004). Removal of dead wood and dead trees- key threatening process listing, DEC, Sydney.

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.

DEC (2007). Loss of hollow bearing trees, key threatening process listing, DEC, Sydney.

DEC/ DPI (2005). Draft Guidelines for Threatened Species Assessment for Part 3A Applications, DEC/ DPI, Sydney.

Department of Environment and Conservation (NSW) (2004). *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* – Working Draft.

Department of Land & Water Conservation (2002) The NSW State Groundwater Dependent Ecosystems Policy. Department of Land & Water Conservation, NSW.

Kavanagh, R.P. and Peake, P. (1993*). Distribution and habitat of nocturnal forest birds in south eastern New South Wales*. In: Olsen, P. (ed.). *Australian Raptor Studies*. Australasian Raptor Association, Royal Australasian Ornithologists Union, Melbourne pg. 101-125.

King, D. (1992). Soil Landscapes of the Wallerwang 1:100 000 Sheet Sydney, Department of Conservation and Land Management NSW.

Office of Environment and Heritage (2012) NSW Atlas of Wildlife, accessed February 2012

Robinson, M .(1996) A field guide to frogs of Australia from Port Augusta to Fraser Island including Tasmania, Australian Museum and Reed Books/New Holland, Sydney.

RPS HSO (2009) Lidsdale Siding Loading Facility Project, Ivanhoe Coal Pty Ltd.

SEWPAC (2012). EPBC Protected Matters Report, accessed February 2012

Strahan, R. (Ed) (2004). The Mammals of Australia. Reed New Holland Books, Australia.

Appendix 1

Known and Expected 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 site at some occurrence. 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. on site during this investigation.

* - 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.
(V) = listed as Vulnerable in NSW.
(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 from within Lithgow LGA (Atlas of NSW Wildlife data)

Data Source: ✓ = Species recorded during this survey

Family Name	*Scientific Name*	Common Name	Recorded
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	✓
	Acanthiza lineata	Striated Thornbill	
	Acanthiza nana	Yellow Thornbill	
	Acanthiza pusilla	Brown Thornbill	✓
	Acanthiza reguloides	Buff-rumped Thornbill	
	Aphelocephala leucopsis	Southern Whiteface	
	Calamanthus pyrrhopygius	Chestnut-rumped Heathwren	
	Gerygone fusca	Western Gerygone	
	Gerygone mouki	Brown Gerygone	
	Gerygone olivacea	White-throated	✓

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

Family Name	*Scientific Name*	Common Name	Recorded
		Cockatoo	
	Cacatua sanguinea	Little Corella	
	Callocephalon fimbriatum	**Gang-Gang Cockatoo (V)**	✓
	Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo	
	Calyptorhynchus lathami	**Glossy Black-Cockatoo (V)**	
	Eolophus roseicapillus	Galah	✓
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	✓
	Coracina papuensis	White-bellied Cuckoo-shrike	
	Coracina tenuirostris	Cicadabird	
	Lalage tricolor	White-winged Triller	
Caprimulgidae	*Eurostopodus mystacalis*	White-throated Nightjar	
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel	
	Vanellus miles	Masked Lapwing	
Cisticolidae	*Cisticola exilis*	Golden-headed Cisticola	✓
Climacteridae	*Climacteris erythrops*	Red-browed Treecreeper	
	Climacteris picumnus victoriae	**Brown Treecreeper (eastern subspecies) (V)**	
	Cormobates leucophaea	White-throated Treecreeper	✓
Columbidae	*Geopelia cuneata*	Diamond Dove	
	Geopelia humeralis	Bar-shouldered Dove	
	Geopelia placida	Peaceful Dove	
	Leucosarcia melanoleuca	Wonga Pigeon	
	Macropygia amboinensis	Brown Cuckoo-Dove	
	Ocyphaps lophotes	Crested Pigeon	✓
	Phaps chalcoptera	Common Bronzewing	
	Phaps elegans	Brush Bronzewing	
Coraciidae	*Eurystomus orientalis*	Dollarbird	
Corcoracidae	*Corcorax melanorhamphos*	White-winged Chough	
Corvidae	*Corvus coronoides*	Australian Raven	✓
	Corvus mellori	Little Raven	
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	✓
	Cacomantis variolosus	Brush Cuckoo	
	Chalcites basalis	Horsfield's Bronze-Cuckoo	
	Chalcites lucidus	Shining Bronze-Cuckoo	
	Chalcites osculans	Black-eared Cuckoo	
	Cuculus pallidus	Pallid Cuckoo	
	Cuculus saturatus	Oriental Cuckoo	
	Eudynamys orientalis	Pacific Koel	
	Scythrops novaehollandiae	Channel-billed Cuckoo	
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird	
Dicruridae	*Grallina cyanoleuca*	Magpie-lark	✓
	Monarcha melanopsis	Black-faced Monarch	

Family Name	*Scientific Name*	Common Name	Recorded
	Monarcha trivirgatus	Spectacled Monarch	
	Myiagra cyanoleuca	Satin Flycatcher	✓
	Myiagra inquieta	Restless Flycatcher	
	Myiagra rubecula	Leaden Flycatcher	
	Rhipidura albiscapa	Grey Fantail	✓
	Rhipidura leucophrys	Willie Wagtail	✓
	Rhipidura rufifrons	Rufous Fantail	
Estrildidae	*Lonchura castaneothorax*	Chestnut-breasted Mannikin	
	Neochmia modesta	Plum-headed Finch	
	Neochmia temporalis	Red-browed Finch	✓
	Stagonopleura bella	Beautiful Firetail	
	Stagonopleura guttata	**Diamond Firetail (V)**	
	Taeniopygia bichenovii	Double-barred Finch	
	Taeniopygia guttata	Zebra Finch	
Eupetidae	*Cinclosoma punctatum*	Spotted Quail-thrush	
	Psophodes olivaceus	Eastern Whipbird	
Falconidae	*Falco berigora*	Brown Falcon	
	Falco cenchroides	Nankeen Kestrel	
	Falco longipennis	Australian Hobby	
	Falco peregrinus	Peregrine Falcon	
	Falco subniger	Black Falcon	
Fringillidae	*Carduelis carduelis**	European Goldfinch	✓
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow	
	Hirundo neoxena	Welcome Swallow	✓
	Petrochelidon ariel	Fairy Martin	✓
	Petrochelidon nigricans	Tree Martin	
Laridae	*Larus novaehollandiae*	Silver Gull	
Maluridae	*Malurus cyaneus*	Superb Fairy-wren	✓
	Malurus lamberti	Variegated Fairy-wren	
	Stipiturus malachurus	Southern Emu-wren	
Megapodiidae	*Alectura lathami*	Australian Brush-turkey	
Meliphagidae	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater	
	Acanthorhynchus tenuirostris	Eastern Spinebill	
	Anthochaera carunculata	Red Wattlebird	✓
	Anthochaera chrysoptera	Little Wattlebird	
	Entomyzon cyanotis	Blue-faced Honeyeater	
	Epthianura albifrons	White-fronted Chat	
	Gliciphila melanops	Tawny-crowned Honeyeater	
	Grantiella picta	**Painted Honeyeater (V)**	
	Lichenostomus chrysops	Yellow-faced Honeyeater	✓
	Lichenostomus fuscus	Fuscous Honeyeater	
	Lichenostomus leucotis	White-eared Honeyeater	
	Lichenostomus melanops	Yellow-tufted Honeyeater	
	Lichenostomus penicillatus	White-plumed Honeyeater	

Family Name	*Scientific Name*	Common Name	Recorded
	Manorina melanocephala	Noisy Miner	✓
	Manorina melanophrys	Bell Miner	
	Meliphaga lewinii	Lewin's Honeyeater	
	Melithreptus brevirostris	Brown-headed Honeyeater	
	Melithreptus gularis gularis	**Black-chinned Honeyeater (eastern subspecies) (V)**	
	Melithreptus lunatus	White-naped Honeyeater	
	Myzomela sanguinolenta	Scarlet Honeyeater	
	Philemon citreogularis	Little Friarbird	
	Philemon corniculatus	Noisy Friarbird	✓
	Phylidonyris niger	White-cheeked Honeyeater	
	Phylidonyris novaehollandiae	New Holland Honeyeater	
	Phylidonyris pyrrhoptera	Crescent Honeyeater	
	Plectorhyncha lanceolata	Striped Honeyeater	
	Xanthomyza phrygia	**Regent Honeyeater (E, E*)**	
Menuridae	*Menura novaehollandiae*	Superb Lyrebird	
Meropidae	*Merops ornatus*	Rainbow Bee-eater	
Motacillidae	*Anthus australis*	Australian Pipit	
Muscicapidae	*Turdus merula**	Eurasian Blackbird	✓
	Zoothera lunulata	Bassian Thrush	
Neosittidae	***Daphoenositta chrysoptera***	**Varied Sittella (V)**	
Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	✓
	Falcunculus frontatus	Eastern Shrike-tit	
	Pachycephala pectoralis	Golden Whistler	
	Pachycephala rufiventris	Rufous Whistler	✓
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	✓
	Pardalotus striatus	Striated Pardalote	✓
Passeridae	*Passer domesticus**	House Sparrow	✓
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	
Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	
	Melanodryas cucullata	Hooded Robin	
	Melanodryas cucullata cucullata	**Hooded Robin (south-eastern form) (V)**	
	Microeca fascinans	Jacky Winter	
	Petroica boodang	**Scarlet Robin (V)**	
	Petroica goodenovii	Red-capped Robin	
	Petroica phoenicea	**Flame Robin (V)**	
	Petroica rosea	Rose Robin	
Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	
	Phalacrocorax melanoleucos	Little Pied Cormorant	✓
	Phalacrocorax sulcirostris	Little Black Cormorant	
	Phalacrocorax varius	Pied Cormorant	✓
Phasianidae	*Coturnix pectoralis*	Stubble Quail	
	Coturnix ypsilophora	Brown Quail	
Podargidae	*Podargus strigoides*	Tawny Frogmouth	

Family Name	*Scientific Name*	Common Name	Recorded
Podicipedidae	*Podiceps cristatus*	Great Crested Grebe	
	Poliocephalus poliocephalus	Hoary-headed Grebe	
	Tachybaptus novaehollandiae	Australasian Grebe	
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler	
	Pomatostomus temporalis temporalis	**Grey-crowned Babbler (eastern subspecies) (V)**	
Psittacidae	*Alisterus scapularis*	Australian King-Parrot	
	Glossopsitta concinna	Musk Lorikeet	
	Glossopsitta pusilla	**Little Lorikeet (V)**	
	Lathamus discolor	**Swift Parrot (E,E*)**	
	Melopsittacus undulatus	Budgerigar	
	Neophema pulchella	**Turquoise Parrot (V)**	
	Platycercus adscitus eximius	Eastern Rosella	✓
	Platycercus elegans	Crimson Rosella	✓
	Psephotus haematonotus	Red-rumped Parrot	
	Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	
	Trichoglossus haematodus	Rainbow Lorikeet	
Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird	
Pycnonotidae	*Pycnonotus jocosus**	Red-whiskered Bulbul	✓
Rallidae	*Fulica atra*	Eurasian Coot	✓
	Gallinula tenebrosa	Dusky Moorhen	✓
	Gallirallus philippensis	Buff-banded Rail	
	Porphyrio porphyrio	Purple Swamphen	
	Pozana fluminea	Australian Spotted Crake	
	Pozana pusilla	Baillon's Crake	
	Pozana tabuensis	Spotless Crake	
	Rallus pectoralis	Lewin's Rail	
Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper (EM)	
	Gallinago hardwickii	Latham's Snipe (EM)	
Strigidae	*Ninox boobook*	Southern Boobook	
	Ninox connivens	**Barking Owl (V)**	
	Ninox strenua	**Powerful Owl (V)**	
Sturnidae	*Acridotheres tristis**	Common Myna	✓
	*Sturnus vulgaris**	Common Starling	
Sylviidae	*Acrocephalus australis*	Australian Reed-Warbler	
	Cincloramphus cruralis	Brown Songlark	
	Cincloramphus mathewsi	Rufous Songlark	
	Megalurus gramineus	Little Grassbird	
Threskiornithidae	*Platalea flavipes*	Yellow-billed Spoonbill	
	Platalea regia	Royal Spoonbill	
	Threskiornis molucca	Australian White Ibis	✓
	Threskiornis spinicollis	Straw-necked Ibis	
Turnicidae	*Turnix varia*	Painted Button-quail	
Tytonidae	*Tyto alba*	Barn Owl	
	Tyto novaehollandiae	**Masked Owl (V)**	
	Tyto tenebricosa	**Sooty Owl (V)**	
Zosteropidae	*Zosterops lateralis*	Silvereye	✓

Known and Expected Mammal List

Appendix Key: ✓ = Species Detected
* = introduced species
(E) = listed as Endangered in NSW.
(V) = listed as Vulnerable in NSW.
(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 from within Lithgow LGA/ 10km search (Atlas of NSW Wildlife)

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

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

Known and Expected Reptile List

Appendix Key: ✓ = Species Detected
* = introduced species
(E) = listed as Endangered in NSW.
(V) = listed as Vulnerable in NSW.
(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 from within Lithgow LGA/ 10km search (Atlas of NSW Wildlife)

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

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

Known and Expected Frog List

Appendix Key: **1** = Results of ecological investigations conducted within the study area
✓ = Species Detected
* = introduced species
(E) = listed as Endangered in NSW.
(V) = listed as Vulnerable in NSW.
(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 from 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*)**	
	Litoria caerulea	Green Tree Frog	
	Litoria citropa	Blue Mountains Tree Frog	
	Litoria dentata	Bleating Tree Frog	✓
	Litoria ewingii	Brown Tree Frog	
	Litoria fallax	Eastern Dwarf Tree Frog	
	Litoria latopalmata	Broad-palmed Frog	
	Litoria lesueuri	Lesueur's Frog	
	Litoria peronii	Peron's Tree Frog	✓
	Litoria phyllochroa	Leaf-green Tree Frog	
	Litoria sp.	Unidentified Tree Frog	
	Litoria verreauxii	Verreaux's Frog	✓
	Litoria wilcoxii		
Myobatrachidae	*Crinia parinsignifera*	Eastern Sign-bearing Froglet	
	Crinia signifera	Common Eastern Froglet	✓
	Heleioporus australiacus	**Giant Burrowing Frog (V, V*)**	
	Limnodynastes dumerilii	Eastern Banjo Frog	✓
	Limnodynastes fletcheri	Long-thumbed Frog	
	Limnodynastes ornatus	Ornate Burrowing Frog	
	Limnodynastes peronii	Striped Marsh Frog	✓
	Limnodynastes tasmaniensis	Spotted Grass Frog	✓
	Mixophyes balbus	**Stuttering Frog (E, V*)**	
	Neobatrachus sudelli	Sudell's Frog	
	Pseudophryne australis	**Red-crowned Toadlet (V)**	
	Pseudophryne bibronii	Bibron's Toadlet	
	Pseudophryne sp.		
	Uperoleia laevigata	Smooth Toadlet	✓
	Uperoleia fusca	Dusky Toadlet	✓

Appendix 2

Flora Species List

Flora Species List

Family	Scientific Name	Common Name
Fabaceae/faboideae/Mimosoideae	*Acacia dealbata*	Silver Wattle
Fabaceae/faboideae/Mimosoideae	*Acacia myrtifolia*	Red Stem Wattle
Rosaceae	*Acaena ovina*	-
Polygonaceae	*Acetosella vulgaris**	Sheep Sorrel
Lamiaceae	*Ajuga australis*	Austral Bugle
Primulaceae	*Anagallis arvensis**	Scarlet Pimpernel
Poaceae	*Austrodanthonia tenuior*	Wallaby Grass
Rutaceae	*Boronia microphylla*	Small-leaved Boronia
Epacridaceae	*Brachyloma daphnoides*	Daphne Heath
Asteraceae	*Brachyscome sp.*	
Poaceae	*Briza maxima**	Quaking Grass
Poaceae	*Briza minor**	Shivery Grass
Pittosporaceae	*Bursaria spinosa* var. *spinosa*	Blackthorn
Anthericaceae	*Caesia parviflora*	Pale Grass Lily
Asteraceae	*Calotis cuneifolia*	Purple Burr Daisy
Asteraceae	*Carduus nutans* subsp. *nutans*	Nodding Thistle
Asteraceae	*Cassinia aculeata*	Dolly Bush
Asteraceae	*Cassinia longifolia*	
Asteraceae	*Cassinia uncata*	Sticky Cassinia
Gentianaceae	*Centaurium erythraea**	Common Centaury,Pink Stars
Gentianaceae	*Centaurium tenuiflorum*	
Sinopteridaceae	*Cheilanthes sp.*	Fern
Sinopteridaceae	*Cheilanthes sieberi* subsp. *sieberi*	Poison Rock Fern
Asteraceae	*Cirsium vulgare**	Spear Thistle
Poaceae	*Cortaderia selloana**	Pampas Grass
Asteraceae	*Craspedia variabilis*	Emu Flower
Malaceae	*Crataegus monogyna**	Hawthorn
Asteraceae	*Cymbonotus lawsonianus*	Bears-ear
Poaceae	*Cynodon dactylon*	Common Couch
Cyperaceae	*Cyperus polystachyos*	-
Poaceae	*Dactylis glomerata*	Cocksfoot
Scrophulariaceae	*Derwentia perfoliata*	Digger's Speedwell
Fabaceae/faboideae	*Desmodium varians*	Slender Tick-trefoil
Phormiaceae	*Dianella caerulea* var. *caerulea*	Flax Lily
Phormiaceae	*Dianella caerulea* var. *producta*	Blue Flax Lily
Phormiaceae	*Dianella revoluta* var. *revoluta*	Spreading Flax Lily
Convolvulaceae	*Dichondra repens*	Kidney Weed
Anthericaceae	*Dichopogon fimbriatus*	Nodding Chocolate Lily
Orchidaceae	*Dipodium punctatum*	Hyacinth Orchid
Orchidaceae	*Dipodium variegatum*	Blotched Hyacinth Orchid

Family	Scientific Name	Common Name
Orchidaceae	***Diuris sulphurea***	**Tiger Orchid**
Droseraceae	*Drosera peltata*	Sundew
Poaceae	*Echinopogon caespitosus* var. *caespitosus*	Tufted Hedgehog Grass
Boraginaceae	*Echium plantagineum**	Paterson's Curse
Poaceae	*Eragrostis brownii*	Brown's Lovegrass
Myrtaceae	***Eucalyptus aggregata***	**Black Gum**
Myrtaceae	*Eucalyptus dives*	Broad-leaved Peppermint
Myrtaceae	*Eucalyptus macrorhyncha*	Red Stringybark
Myrtaceae	*Eucalyptus mannifera* subsp. *mannifera*	Red-spotted Gum
Myrtaceae	*Eucalyptus pauciflora*	Snow Gum
Myrtaceae	*Eucalyptus rubida subsp. rubida*	Candlebark
Myrtaceae	*Eucalyptus sieberi*	Silvertop Ash
Myrtaceae	*Eucalyptus stelluata*	Black Sallee
Myrtaceae	*Eucalyptus viminalis*	Ribbon Gum
Asteraceae	*Euchiton involucratus*	Star Cudweed
Asteraceae	*Euchiton sphaericus*	-
Geraniaceae	*Geranium homeanum*	Northern Cranesbill
Geraniaceae	*Geranium solanderi*	Cutleaf Cranesbill
Fabaceae/faboideae	*Glycine clandestina*	Twining Glycine
Haloragaceae	*Gonocarpus tetragynus*	Poverty Raspwort
Goodeniaceae	*Goodenia bellidifolia*	Daisy-leaved Goodenia
Goodeniaceae	*Goodenia hederacea* subsp. *hederacea*	Ivy-leaved Goodenia
Fabaceae/faboideae	*Hardenbergia violacea*	False Sarsparilla
Boraginaceae	*Heliotropium amplexicaule*	Blue Heliotrope
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower
Dilleniaceae		*Hibbertia obtusifolia*
Fabaceae/faboideae	*Hovea linearis*	-
Apiaceae	*Hydrocotyle peduncularis*	Pennywort
Clusiaceae	*Hypericum gramineum*	Small St Johns Wort
Clusiaceae	*Hypericum perforatum**	St Johns Wort
Asteraceae	*Hypochaeris radicata**	Flatweed
Hypoxidaceae	*Hypoxis hygrometrica*	Golden Star
Poaceae	*Imperata cylindrica*	Blady Grass
Lamiaceae	*Lamium amplexicaule**	Dead Nettle
Myrtaceae	*Leptospermum arachnoides*	-
Myrtaceae	*Leptospermum polygalifolium* subsp. *polygalifolium*	Tantoon
Asteraceae	*Leucochrysum albicans*	-
Epacridaceae	*Leucopogon virgatus*	-
Epacridaceae	*Lissanthe strigosa*	Peach Heath
Lomandraceae	*Lomandra confertifolia*	Mat-rush
Lomandraceae	*Lomandra filiformis* subsp. *filiformis*	Wattle Mat-rush
Lomandraceae	*Lomandra glauca*	Pale Mat-rush

Family	Scientific Name	Common Name
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Solanaceae	*Lycium ferocissimum**	African Boxthorn
Poaceae	*Melinus repens**	Red Natal Grass
Poaceae	*Microlaena stipoides* var. *stipoides*	Weeping Rice Grass
Orchidaceae	*Microtis sp.*	
Loganiaceae	*Mitrasacme polymorpha*	Mitrewort
Oxalidaceae	*Oxalis perrenans*	Yellow-flowered Wood Sorrel
Oxalidaceae	*Oxalis radicosa*	-
Asteraceae	*Ozothamnus diosmifolius*	Ball Everlasting
Poaceae	*Panicum sp.*	-
Poaceae	*Pennisetum clandestinum**	Kikuyu
Proteaceae	*Persoonia chamaepitys*	Mountain Geebung
Rosaceae	*Photinia serratifolia**	Hawthorn
Plantaginaceae	*Plantago debilis*	Slender Plantain
Plantaginaceae	*Plantago lanceolata**	Ribwort
Apiaceae	*Platysace ericoides*	Heathy Platysace
Poaceae	*Poa labillardieri* var. *labillardieri*	Tussock Grass
Poaceae	*Poa seiberiana*	Tussock Grass
Poaceae	*Poa seiberiana* var. *cyanophylla*	-
Euphorbiaceae	*Poranthera microphylla*	-
Fabaceae/faboideae	*Pultenaea microphylla*	-
Ranunculaceae	*Ranunculus repens**	Creeping Buttercup
Rosaceae	*Rubus ulmifolius**	Blackberry
Salicaceae	*Salix fragilis**	Crack Willow
Asteraceae	*Senecio madagascariensis**	Fireweed
Caryophyllaceae	*Silene gallica**	French Catchfly
Asteraceae	*Sonchus asper**	Prickly Sow-thistle
Anthericaceae	*Sowerbaea juncea*	Vanilla Plant
Stylidiaceae	*Stylidium sp.*	
Poaceae	*Themeda australis*	Kangaroo Grass
Anthericaceae	*Thysanotus tuberosus*	Fringed Lily
Anthericaceae	*Tricoryne elatior*	Yellow Rush Lily
Fabaceae/faboideae	*Trifolium repens**	White Clover
Fabaceae/faboideae	*Ulex europaeus**	Gorse
Scrophulariaceae	*Verbascum virgatum**	Twiggy Mullein
Scrophulariaceae	*Veronica plebia*	Creeping Speedwell
Violaceae	*Viola hederacea*	Ivy-leaved Violet
Campanulaceae	*Wahlenbergia gracilis*	Australian Bluebell
Campanulaceae	*Wahlenbergia stricta* subsp. *stricta*	Austral Bluebell
Asteraceae	*Xerochrysum bracteatum*	Golden Everlasting
Myrtaceae	*Eucalyptus stellulata*	Black Sally
Asteraceae	*Chrysocephalum apiculatum*	Yellow Buttons
Thymelaeceae	*Pimelea sp.*	Pimelea

Appendix 3

Qualifications

RPS

Curriculum Vitae

MATTHEW DOHERTY

Manager - Ecology & GIS Newcastle, NSW

Technical Director Ecology

Bachelor of Landscape Management and Conservation (Land & Water Conservation Major), University of Western Sydney, 2002

Bushland Regeneration Certificate II, Western Sydney Institute of TAFE, 1999

Spikeless Tree Climbing Techniques, Total Height Safety, 2004

OH&S Induction Training (Green Card)

NPWS Scientific Investigation Licence

NSW Animal Ethics Research Authority

Senior First Aid

AREAS OF EXPERTISE:

Matt has eight years experience in the environmental industry with key skills in project management, survey design, GIS and client relations. In his position as Technical Director (Ecology), Matt manages environment department including the day to day running of projects, verification of reports and other outputs and ensures clients are well informed of project progress and key findings. Matt's background in local government, state government and private consultancy gives him a high level of appreciation of the environmental and consultancy sector, thus allowing him to take a pragmatic approach to providing successful conservation and development outcomes whilst meeting the aims and objectives of clients and determining authorities.

SELECTED PROJECT EXPERIENCE:

Ecology and GIS

- **Various large-scale land development, mining, energy and infrastructure projects** – Matt has project managed and/or participated in numerous large-scale land development, mining, energy and infrastructure projects including Queensland Hunter Gas Pipeline (850km); Hunter Gas Pipeline; Rio Tinto Lower Hunter Lands Project; GIS biodiversity, large scale vegetation, habitat and predicative modelling mapping works; wind farms and coordination of environmental monitoring programs for mines

PREVIOUS EXPERIENCE:

Ecologist – Andrews Neil Pty Ltd **2004 - 2005**

Duties included: preparation of Fee Proposals for Ecological Services; General and Targeted Flora and Fauna Surveys including Flora and Fauna Identification; Desktop Studies and Literature Searches; Interpretation and Application of Legislation; report preparation including Threatened Species Assessments (8 part test), Vegetation Management Plans (Riparian Restoration/ Rehabilitation, Bush Regeneration), Species Impact Statements, Weed Management Strategies, Habitat Management Strategies and Tree Assessments; GIS/ Spatial Analysis and Database Management; Liaison with Client, Stakeholder Groups, State and Local Governing Bodies; Site Supervision of Ecological Conditions; Tree Climbing for installation, maintenance and monitoring of nestboxes.

Project Officer / Horticultural Services – Gosford City Council **06/2003 – 05/2004**

Comprehensively reviewed noxious weed management; performed vegetation surveys on GCC landfills to identify the presence of noxious weeds; quantify the extent of infestation of each noxious weeds species and map the affected areas; developed a management plan for the control of NW species identified in the survey in accordance with relevant legislation; maintained Japanese Gardens along with City Wide Gardens and Streetscapes.

Environmental Officer - Dept of Land & Water Conservation, Newcastle **01/1999 – 12/1999**
Liaised with relevant agency and stakeholder groups; researched and prepared an extensive literature review of issues pertaining to riparian vegetation; assessed current best practice for revegetation and rehabilitation of degraded sites; prepared a Riparian Revegetation Management Strategy

Volunteer – Maitland City Council **07/1999 – 12/1999**
Assisted with Rivercare implementation throughout LGA. Utilised primary, secondary and field research to prepare a River Plan under 'Rivercare' guidelines.

Volunteer – Brisbane Waters & Gosford Lagoons Catchment Management Committee **03/1998 – 05/1998**
Prepared Riparian Zone Rehabilitation Plan for Degraded Creek Management, Research and prepared a Riparian Zone Rehabilitation Project. Member on several Gosford City Council steering committees and working groups.

MEMBERSHIPS & ACHIEVEMENTS:

- Fire Protection Association Australia (FPAA)

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

LAUREN VANDERWYK

Graduate Ecologist

Newcastle, NSW

Bachelor of Science, University of Newcastle

AREAS OF EXPERTISE:

Lauren has a broad range of ecological field experience and experience in Ecological Assessment reporting. Her experience within the consulting industry has primarily included a wide range of flora and fauna assessment disciplines as required by a wide range of public and private clients. Lauren's knowledge of the Central Coast and Newcastle regions has expanded extensively since the commencement of her career, particularly in the area of threatened flora and fauna species.

SELECTED PROJECT EXPERIENCE:

Environment

- Flora and fauna identification and habitat assessment
- Targeted threatened flora and fauna surveys
- Delineation and mapping of vegetation communities
- Endangered Ecological Community (EEC) assessment
- Conducting Field Surveys for Flora, Fauna and Habitat Identification
- Report Preparation including Fauna & Flora Assessments
- Ecological Monitoring and Reporting
- Bushfire Threat Assessment & Management reporting
- Understanding of environmental legislation.

Ecology

- **Centennial Coal Charbon**– Field surveys identifying management issues for the development of a Compensatory Habitat Management Plan at Charbon Colliery
- **Morisset** – Flora and fauna surveys to produce an Ecological Assessment and Bushfire Threat Assessment

PREVIOUS EXPERIENCE:

Environmental Scientist - Ecobiological **(2011)**

Primary roles included bush regeneration and the identification of a wide range of native and non-native plant species for rehabilitation of various sites. Some ecological surveys and Ecological Assessment reporting was carried out during her time with Ecobiological.

Trainee Ecologist - Pygmy Possum Ecological Consulting **(2008-2010)**

Ecological field surveys were the main role at Pygmy Possum. Fauna surveys carried out across the Central Coast have provided for an increased knowledge in common and threatened fauna species as well as the vegetation communities in which they inhabit. Exposure to ecological reporting also occurred.

Volunteer Experience including:

- Biodiversity research for independent researchers and Australian Geographic in East Kimberley (2011);
- Amphibian (*Litoria subglandulosa* and *Mixophyes balbus*) research at the New England Tablelands with Simon Clulow, Carl Gerhardt and Marion Anstis (2010);

- Bandicoot Research in Manly with the Australian Wildlife Conservancy (2010);
- Microbat dietary surveys and tracking at Empire Bay with Leroy Gonsalves (2010);
- Green and Golden Bell frog research at the Sydney Olympic Park (2010);
- Bush regeneration at Wamberal Lagoon Nature Reserve with National Parks and Wildlife Services primarily restoring Littoral Rainforest (EEC) (2007-2010);
- Fauna research including pit trapping, Elliot trapping, triangulation (for amphibians) and spotlighting for the Watagans fauna database (2007); and
- Bush-stone Curlew surveys at Empire Bay on the Central Coast undertaking call play back methods (2010).

MEMBERSHIPS & ACHIEVEMENTS:

- NSW Driver's Licence (Class C)
- OH&S Induction Training (White Card)
- ChemCert II certification
- Landscape Function Analysis Training
- Member of the Ecological Society of Australia (ESA)
- Member of the Hunter Bird Observatory Club (HBOC)

Curriculum Vitae

CHRIS MCLEAN

Ecologist

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

Bachelor of Environmental Science (Honours Class 1, 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.

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