

APPENDIX JA

FAUNA REPORT (1997)

TEXT/REPORT

FAUNA ASSESSMENT

INVINCIBLE COLLIERY PROPOSED OPEN-CUT

FEBRUARY 1998

**Prepared for Craven, Elliston &
Hayes (Lithgow) Pty Limited**

by

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Section 1.0

Introduction

1.1 BACKGROUND

Coalpac Pty Limited is submitting an application for the development of an open cut coal mine approximately 1.5 kilometres north of the Invincible Colliery. This development would include the open-cut mine, proposed haul road connecting the mine with the Invincible pit-top and areas dedicated to overburden placement as well as top-soil and plant storage.

This proposal would potentially disturb a maximum 28 hectares of private, freehold and state-forest land. The proportion of this land to be actually disturbed from the proposal is directly related to the quantity and quality of steaming coal that can be viably won from currently existing underground operations.

The agricultural land is currently used for grazing purposes with the state forest remaining in a relatively natural state. Isolated areas fringing these two regions have been previously disturbed by open cut mining in the 1950's.

1.2 PURPOSE OF THIS REPORT

This report presents details of the fauna assessment undertaken to support the application.

The fauna assessment addresses requirements of:

- the *Environmental Planning and Assessment Act, 1979*;
- the *Threatened Species Conservation Act, 1995*; and
- the *State Environmental Planning Policy, Number 44 — Koala Habitat Protection (SEPP No. 44)*.

1.3 PROPOSED OPEN CUT DEVELOPMENT

Extension of the proposed open-cut mine site would involve the following:

- constructing a connecting haul road between the site and the Invincible pit top. Associated with this haul road, water run-off and sediment control devices would be constructed;
- clearing available land to make way for the proposed open-cut and its associated run-off and sediment control devices as required;

- use of selected areas for plant storage, topsoil storage and temporary overburden placement; and
- rehabilitation programs over the disturbed site after the finalisation of the operations.

The mining operations are expected to be staged over a three to five year period depending on the availability of coal from other sources.

1.4 STUDY AIMS

The main aim of this study was to determine the level of impact on threatened native fauna species and their habitats as a result of the proposal. To achieve this, the field survey and subsequent assessment aimed to:

- identify fauna species within the subject site;
- assess the capability of the subject site to support threatened fauna species as identified in Schedule 1 and 2 of the *Threatened Species Conservation Act, 1995*;
- determine the regional significance of threatened fauna species and impact of the proposal;
- detail ameliorative measures to minimise potential impacts the proposal may have on threatened fauna; and
- determine whether the development is likely to have a significant effect upon threatened species, their populations or ecological communities.

1.5 REPORT FORMAT

This report is presented in five sections as detailed below:

Section 1 provides a brief background to the study and proposed open-cut, lists the study aims and outlines the format of the report.

Section 2 outlines the study methodology and limitations.

Section 3 presents results of the fauna survey.

Section 4 details assessment of the proposal including potential impacts, the significance of the impacts and amelioration measures.

Section 5 presents the study's conclusions.

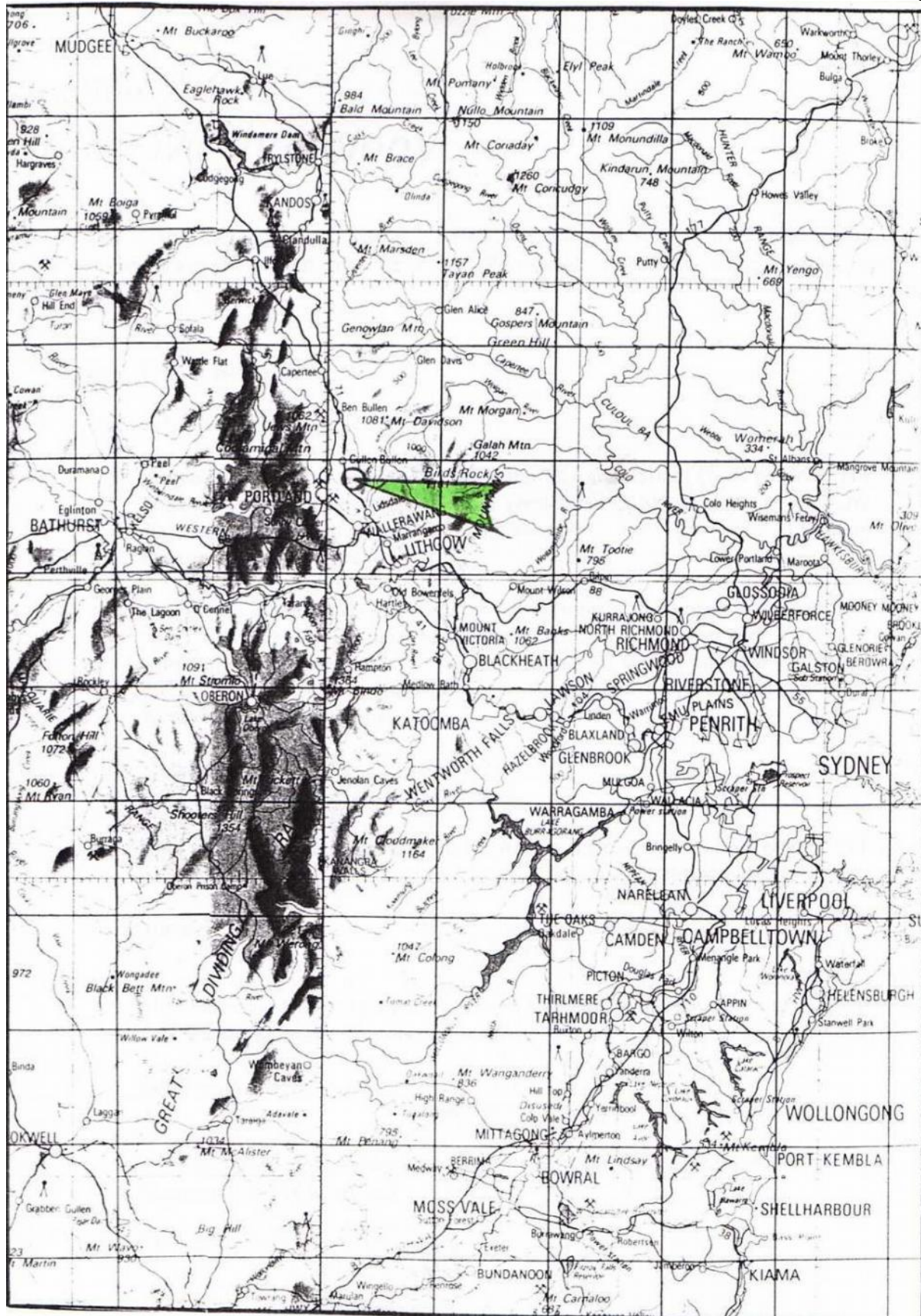


FIGURE 1.1

Site Location

Section 2.0

Study Methodology

The study methodology consisted of three stages: field survey; background data collection and review; and data assessment. This section details each component of the study.

2.1 FIELD SURVEY

2.1.1 General

The field survey was conducted between the 20th and 25th of October 1997. The survey was conducted by Mr Dean Lavers (Ba Ap Sci. Env Tech) of Terra Sciences and was assisted by Mr Graeme Muir (Ba Ap Sci. Env Tech) of Craven, Elliston and Hayes Pty Ltd.

At the time of the survey, weather conditions remained mainly clear and mild to warm. Daytime temperatures steadily increased during the week with night-time temperatures remaining cool to cold. A heavy mist settled on night one of the survey. No other forms of precipitation were recorded over the survey period. Weather data was as follows:

Monday 20/10: Min; 1 °C
 Max; 21 °C

Cool to fine day, high scattered cloud. Breezes increasing to late afternoon with build up of high cloud from south. Heavy wetting mist at approximately 11.00pm.

Tuesday 21/10: Min: 2 °C
 Max: 23 °C

Mild clear day after cold night. Scattered high cloud with day warming quickly. Fine still day until late afternoon. Light breezes throughout whole night from west.

Wednesday 22/10: Min: 1 °C
 Max: 22 °C

Fine day, slight breezes from the west. Light, high cloud progressively building during mid to late afternoon.

Thursday 23/10: Min: 0°C
 Max: 24°C

Fine clear day, late breezes developing from west. Heavy cloud build up in late evening.

Friday 24/10: Min: 4°C
 Max: 27°C

Mild to warm day. Clear with very little wind. No cloud. Very mild evening until late.

Saturday 25/10 Min: 3°C
 Max (at time of pack up, 12.30pm; 21°C)

Mild morning with heavy overnight dew-fall. Light breeze developing into late morning.

2.1.2 Fauna

The methodology for the fauna survey involved:

- a literature review;
- field inspection to assess habitat type and quality; and
- more detailed stratified field survey targeting subject species.

An initial reconnaissance by vehicle around the survey area was carried out with landform and vegetation units located and correlated with aerial photograph and topographic map details. Much of the site was later traversed on foot in order to obtain a visual overview of community diversity, habitat diversity and ground features.

More specific habitat evaluation was then carried out within the identified communities. Data on basic vegetative structure and coverage were noted. In addition to this more specific notes were made on habitat type, diversity, disturbances and observed species using each site.

Formal appraisal of the subject site included complete, on-foot coverage and assessment of the various communities and habitat types. Once sufficient analysis of the site as a whole had been made, individual plots were allocated to differing communities. Each habitat assessment plot was confined to a particular community configuration and measured 50 by 50 metres in area. Field notes were sketched and recorded for each habitat assessment plot (**Appendix D**). Any cryptic species (ie, any species which is not immediately identified or may be easily confused with similar, more common species) or traces were observed, sampled and identified through references, keys or through identification services after the survey.

The fauna survey was restricted to terrestrial vertebrates (that is, birds, bats, reptiles, amphibians and mammals). A list of recorded fauna is included in **Appendix A**. Common, endangered and vulnerable species were all targeted during this survey with special consideration made to sampling and quantifying prospective habitat used by those species of threatened status (subject species).

A range of trapping and detection techniques was used for the fauna survey. Much of the survey process concentrated on the significance of various habitat occurring over the study area. Areas which required a greater level of investigation and monitoring included communities where floristic structure was more diverse or complex; regions which contained uncommon communities or habitat; or areas which indicated higher levels of fauna activity. All fauna species observed opportunistically in the field were identified and noted. Associations between vegetation groups and habitat types were assessed wherever possible.

This methodology was designed to determine population and species diversity within the different habitat types and also identify potential habitat which may provide resources for subject species.

“Trapping plots” were positioned to cover a range of more intact vegetation communities and types.

Fauna habitat assessment was then carried out, which involved:

- the assessment of the fauna of the site in terms of its overall distribution, possible habitat and abundance;
- the identification of possible fauna of conservation significance;
- the identification of fauna habitats of conservation significance;
- the assessment of the importance of fauna which may occur at the site in a regional and state context;
- the assessment of the impacts upon possible rare and endangered fauna species; and
- the review of the status of habitats and existing fauna.

i) Frogs and Reptiles

Amphibian calls were listened for and identified during both the diurnal and nocturnal components of the survey. Any species uncovered opportunistically were recorded in the field.

Areas that could provide habitat for a greater number of species were targeted specifically during the amphibian component of this survey. Specific searches for

frogs were made at night while spotlighting for fauna between 7.00 pm and 11.00 pm.

Opportunistic searches were carried out for reptiles in areas that were identified as suitable or potential habitat. Cryptic and threatened species were targeted more closely, with potential critical habitat for these species investigated more thoroughly. Searches involved:

- turning (and replacing) rocks;
- examining crevices;
- lifting exfoliations;
- turning logs and other ground cover;
- selectively raking through leaf litter in suitable places;
- lifting decorticating bark and tree debris where present;
- visually scanning stumps, branches and tree trunks;
- closely inspecting clearings such as dirt tracks for active and inactive specimens as well as those thermo-regulating or feeding; and
- surveying for tracks.

The area under observed raptor feeding roosts was also checked for remains of reptiles. Sloughed skins, clutches of eggs, tracks and anthill diggings indirectly indicate species presence, and were noted during the survey.

To assist in the identification of various reptile and amphibian species, pitfall trap lines 30 metres long with pits positioned less than every ten metres were established in areas with habitat more suitable for these species. These traps were left in place for the duration of the survey and checked morning and night.

ii) Birds

Data was recorded in the field on the number of birds present, flock characteristics behaviour and movement through surrounding woodlands and pasture areas.

All bird species were identified and recorded in the field through opportunistic sighting, point observation and plot searches. Identification of bird species was assisted by dropped feathers, flight characteristics, droppings, crop pellets and vocalisations.

Point observation searches for endangered, cryptic and locally uncommon species were also made. Places where habitat was recorded as suitable for threatened species were used as point observation locations.

Point observations involved remaining in a secluded area for at least a one to two hour period. A pair of field binoculars (10 X 25 magnification) was used to observe birds. These point observation surveys took place between 5.00 am and 8.00 am, and 5.00 pm and 7.30 pm. Opportunistic sightings were also made while surveying other components.

Nocturnal birds were surveyed before and during spotlight searches. Survey procedure included traversing vehicular tracks and suitable habitat, both in a vehicle and on foot; and illuminating the surrounding paddocks and trees with a hand held spotlight. Bird calls, scats and crop pellets heard and found in the subject site were recorded. Stationery point searches for nocturnal birds were also carried out from the vehicle situated at determined flight areas or hunting corridors or carried out from the bat recording sites.

Searches for characteristic whitewash caused by owls using regular roosts or nests were made in combination with searches for regurgitation pellets. Both of these are indirect evidence of presence, and aid identification of owl species.

Additional searches for endangered, cryptic and locally uncommon species were made. Places where the habitat appeared suitable for these species were given particular attention.

iii) Mammal Species

Mammals were surveyed using a range of direct and indirect techniques. Survey methods for mammal species included:

- Elliot and hair tube trapping;
- opportunistic sightings;
- searching for tracks and traces including carcass fragments, markings, faeces and hair;
- searches under and in hollow ground logs; and
- spotlighting searches.

The survey strategy of small terrestrial mammals was determined by micro-habitat features of the subject site identified during daylight surveys and investigated during the night.

Two direct survey methods were used. These included Elliot trapping and the use of hair tubes. Trapping was undertaken over five nights using Elliott type B traps (46 x 15.5 x 15 cm) baited with a universal bait consisting of peanut butter, rolled oats and honey. Traps were located only at strategic sites where habitat indicators or direct traces exhibited the potential for a subject species. A total of 250 Elliott-trap nights were expended during the survey.

Traps were positioned next to logs, rock piles, fallen branches, small shrubs and thick grass, animal diggings, tree trunks and visible animal runways within long grass. Traps were checked as soon as possible after sunrise each morning, closed and then reopened before sun-down.

Hair tubes were used to determine the presence of small terrestrial and scansorial mammals. Hair tubes allow for sampling of mammals through the collection of animal hairs without trapping animal specimens.

Three lines of 25 Hair tubes baited with universal bait were placed across the subject site. Each hair tube was left for five consecutive nights. It was assumed that any small mammal species moving throughout the subject site may investigate any hair tube that it encountered. Hair tubes were separated by at least 30 metres.

Any examination of unknown hair samples was undertaken by an expert in the analysis of hair sample identification. (B. Triggs, Genoa. VIC.)

A spotlight survey was undertaken and covered all accessible areas on the site including pasture lands, regeneration areas, mature and young woodlands as well as isolated standing trees and drainage depression areas. Areas considered likely to provide habitat for important species were traversed in a zigzag pattern scanning the existing trees and surrounding countryside with a hand held spotlight, either from a vehicle or by foot. Animals heard calling or observed were investigated and identified in the field wherever possible.

Predator scats were used to provide a record of fauna that occurred in the area. Predator and mammal scats were collected opportunistically throughout the survey site. Searches of scats were also conducted during the flora component of this survey.

Medium to large terrestrial mammals were surveyed with Hair tubes and spotlighting. Hair tubes were set up as detailed previously. The location of these tube lines is indicated in **Figure 2.1**.

Searches were made for indirect evidence to suggest the presence of mammals, including scats, examination of burrows, tracks, diggings, investigation of remains and identification of vocalisations. Spotlighting was also undertaken in conjunction with other mammal and nocturnal bird spotlighting.

iv) Microchiropteran Bats

Two survey methods were employed in order to detect the presence of bats. These included harp trapping and electronic call detection and recording.

Early in the survey period, some specific bat call recording was made earlier in the night with a hand held 100 watt spotlight, so that notes on the bats' flying characteristics and features could be recorded. These observations were used to ascertain the suitability for harp trapping.

Specific habitat types were traversed by foot and vehicle with each pass covering up to 1,000 metres.

A harp trap with a trapping dimension of approximately two by two metres was set at the edge of a small vegetated water retention site. This site was selected due to its sheltered position, the presence of insects and the presence of a suitable foraging flight path. The trap was set across the determined flight path and electronically monitored. The trap was routinely checked during the night. Large open pasture lands and broad open woodland areas are difficult to trap using the harp trap, and therefore the old open cut site was selected for the harp trap site for the reasons mentioned above. Screening was attached to the side of the traps to increase trap success.

In view of the need for constant supervision, mist-nets were not used routinely during the field survey as a number of sites needed to be surveyed concurrently. Mist-nets are logistically difficult to operate and must be tended regularly through the night to retrieve bats before they chew their way through the net and escape and must also be closed before dawn to prevent capture of birds.

Many types of bats can be adequately surveyed through the monitoring of their species specific echolocation calls. Identification of echolocation calls is presently the only practical method for surveying many of the species which forage high in or above woodland canopies. A further advantage is that the detection system does not need attendance during its call recording phase and a detector coupled with a time delay switch can successfully record all calls detected during the night as well as indicating the time at which those calls were recorded. During this survey the detectors recorded bat activity through their ultrasonic calls. The recorder is coupled with the time delay switch, being activated at sundown and automatically shut off by the light sensor switch at pre-dawn.

Five sites attributed with contrasting habitat types were established for bat surveying. Each site was electronically monitored between dusk to dawn using a

Titley electronics Anabat II bat detector coupled with an Anabat II delay switch. The location of these sites is shown on **Figure 2.1**.

Table 2.1 shows the survey protocol carried out for this assessment.

TABLE 2.1	
SURVEY PROTOCOL PER DAY	
Component	Protocol
Amphibians	>2 hour night spotlighting habitat, call recording when required, 3 X 30 metre pitfall lines.
Reptiles	One hour search of plot and immediate vicinity. Pitfall: 3 lines (30 metre) bordering potentially viable habitat. Objective searches of potential habitat (e.g. opportunistic log rolling), opportunistic tracks/traces (e.g. dusty road).
Birds: (Diurnal)	Walked transects (>1 km through potential habitat) 2 objective point surveys (am, pm) (e.g. waterhole, elevated viewing area).
(Nocturnal)	2 hours/night in conjunction with bat survey. Opportunistic findings of remains/traces; during plot workings.
Mammals: (Small)	3 Elliot trap lines, each <30 traps (opened 1 hour before dusk - checked 1 hour after dawn) 3 hair tube lines 25 traps (left for minimum of 5 days) 2 hour spotlighting: vehicle/walking
(Large)	Done in conjunction with small mammal spotlight searches.
Bats	2 hours manual Anabat detection/recording (>1,000 mt traversed) in conjunction with 1 hour spotlighting. 1 Harp trap site. Anabat II electronic recording, light on/or activation with time delay: dusk to dawn. (5 locations)

2.1.3 Survey Limitations

It is considered that climatic conditions had no significant impact on the study's effectiveness. Weather would have provided many species of fauna with favourable conditions with adequate vegetation and accessible water observed during the study. Further, climatic conditions are not believed to be significant as the study has primarily assessed habitat quality and quantity.



Invincible Colliery Survey Map



- Harp Trap Locations
- 4 Habitat Assessment Plots
- 1 Bat Recording Locations
- |-----| Hair Tube Transects
- |.....| Elliot Trapping Transects
- ~~~~~ Pit-fall Lines



FIGURE 2.1
Survey Map

2.2 BACKGROUND DATA COLLECTION

The range and characteristics of fauna habitat in the study area was initially investigated using a 1: 25 000 aerial colour photograph (Wallerawang Run 9 24-9-91), the Cullen Bullen 1:25 000 topographic map and the Wallerawang 1: 100 000 vegetation mapsheet (Benson and Keith 1990).

Searches of the National Parks and Wildlife Services' Atlas of NSW Wildlife databases were made for the 1:100 000 mapsheet covering the site and its regional surroundings (Wallerawang 8831).

Available literature detailing the distribution of threatened fauna (mainly Ayers, 1995) were reviewed to obtain a list of threatened species could occur in the region.

Additional literature referenced for this assessment included three fauna surveys undertaken recently in the locality. These include a fauna survey of Baal Bone Colliery (Leong Lim, 93), a fauna survey at Cullen Bullen (Patrick Antcliff, 97) and the bat surveys conducted at Thomson Creek and Cullen Bullen (Ray Williams 97). These reports are fully referenced in the References section of this report.

Section 3.0

Results

3.1 BACKGROUND DATA

3.1.1 Land Use

Current land use is limited to agricultural purposes with a larger proportion as State Forest lands.

Approximately 20 percent of the proposed area to be disturbed, consists of pasture land. Both sheep and cattle have been grazed on the pasture areas. Some form of fallowing or pasture improvement has taken place over this region. Two small dams have been established and occasional mature and younger aged eucalypts have been retained across the site. The site was currently being grazed by cattle at the time of the survey. Parts of the site indicated recent excavations and clearing. Toward the western edge of the pasture lands some localised slumping has occurred due to subsidence of underground coal workings.

Around a further 10 percent of the site has been used for prior open cut workings dating back to the 1950's. Much of this area has since regenerated with eucalypts or low shrub species. The irregular form of the old workings have created small water ponding areas and stoney outcrops.

The rest of the site is made up of State Forest woodland. This fringes three sides of the proposed mining site. The woodland community comprises of predominantly eucalypt dominated communities on the flats, slopes and ridges. Tussock grasslands and sedge communities exist within the more sheltered and deeper gullies. Areas of the woodland are accessed by trails and roadways.

Local relief is less than 40 metres with an elevation of approximately 900 metres above sea level. Slope ranges between less than five per cent up to 30 percent with a generally south westerly aspect.

Indefinite perennial drainage depressions run westward through the site and extend from the upper slopes to the north and east of the site. Water flow within this drainage line is directly related to rainfall over the localised catchment area and drains away quickly.

3.1.2 Database Searches and Range Data

The Atlas of New South Wales Wildlife database listed seven threatened fauna species in the region. Results of the database searches are listed in **Table 3.1**. No threatened species have been recorded on the site.

TABLE 3.1	
THREATENED SPECIES DATABASE RECORDS	
THREATENED SPECIES DATABASE RECORDS	
Threatened Fauna Recorded for 8931 Mapsheet NPWS Atlas of NSW Wildlife	
Square-tailed Kite	<i>Eulamprus leuraensis</i> (E1)
Glossy Black Cockatoo	<i>Lophoictinia isura</i> (V)
Turquoise Parrot	<i>Calyptorhynchus lathami</i> (V)
Powerful Owl	<i>Neophema pulchella</i> (V)
Regent Honeyeater	<i>Ninox strenua</i> (V)
Painted Honeyeater	<i>Xanthomyza phrygia</i> (E1)
Koala	<i>Grantiella picta</i> (V)
	<i>Phascolarctos cinereus</i> (V)
V =	Vulnerable Species listed under the <i>Threatened Species Conservation Act 1996</i>
E1 =	Endangered Species listed under the <i>Threatened Species Conservation Act 1996</i>
E4 =	Presumed Extinct Species listed under the <i>Threatened Species Conservation Act 1996</i>

Threatened species range data (National Parks and Wildlife Service, 1997) were reviewed to compile a list of threatened species that are likely to occur in the region. This review yielded a further 31 threatened fauna species which are listed in **Table 3.2**.

TABLE 3.2			
THREATENED SPECIES BASED ON RANGE DATA			
Fauna			
Painted Burrowing Frog	E1	Magpie Goose	V
Elampurs learaensis	E1	Freckled Duck	V
Broad-headed Snake	E1	Blue-billed Duck	V
Spotted-tailed Quoll	V	Square-tailed Kite	V
Eastern Quoll	E1	Grey Falcon	V
Brush-tailed Phascogale	V	Brolga	V
Koala	V	Bush Thick-knee	E1
Yellow-bellied Glider	V	Mongolian Plover	V
Squirrel Glider	V	Painted Snipe	V
Rufous Bettong	V	Black-tailed Godwit	V
Black-striped Wallaby	E1	Glossy Black-cuckatoo	V
Brush-tailed Rock-wallaby	V	Swift Parrot	V
Yellow-bellied Sheath-tail-bat	V	Turquoise Parrot	V
Large Pied Bat	V	Powerful Owl	V
Great Pipistrelle	V	Masked Owl	V
Little Bent-wing Bat	V	Pink Robin	V
Common Bent-wing Bat	V	Regent Honeyeater	E1
Large-footed Mouse-eared Bat	V	Painted Honeyeater	V
Australasian Bittern	V	Bathurst Copper Butterfly	E1
Black-necked Stock	V		
V = Vulnerable Species listed under the Threatened Species Conservation Act 1996 E1 = Endangered Species listed under the Threatened Species Conservation Act 1996 E4 = Presumed Extinct Species listed under the Threatened Species Conservation Act 1996			

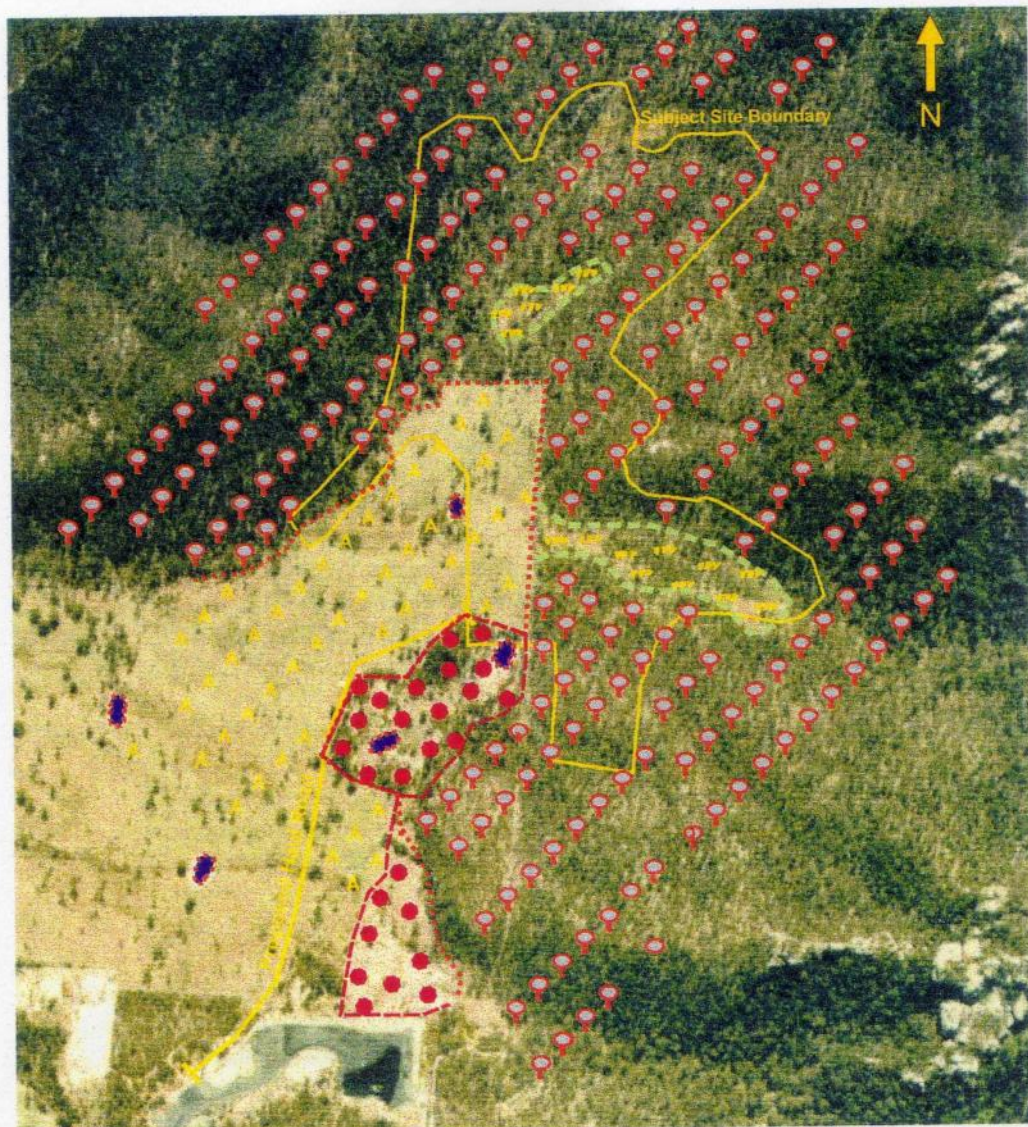
3.2 FAUNA

The site is made of four general habitat zones. These are as follows:

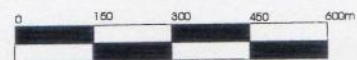
- previously cleared agricultural pasture land;
- previously cleared and regenerating open cut area;
- tussock and sedge community defined by gullies and depressions; and
- tall standing eucalypt dominated forests .

All areas would be potentially impacted on by the proposed open cut operation. All these areas were surveyed with sample plots taken within each zone.

Fauna species which were observed during the field investigations are listed in **Appendix A**. All fauna identified are commonly occurring species of this region.



Invincible Colliery Fauna Survey. Habitat Zones



Dams and Water Holding Depressions



Cleared Agricultural Land



Tall Eucalypt Dominated Forest



Tussock and sedge Community
(Defined by lower gully areas)



Regenerating Open-cut area



FIGURE 3.2
Habitat Zones

The site comprises of two broadly contrasting land systems. These are the cleared agricultural lands and the forested areas. Species which are able to utilise facets of both habitat types favour this contrasting and abrupt edge. Many of these species include those which are common to woodland and forests fragmented by agricultural lands within the region. The native species observed inhabiting the subject site are usually capable of adapting to human or agricultural disturbances. Examples of such species are the Eastern Grey Kangaroo, Wombat, Spiny Cheeked Honeyeater and the Magpie.

3.2.1 Introduced Species

The presence of feral predators such as cats and foxes was observed during the study. Super-predators such as these are able to thrive in areas like the site due to the abundance of easily available prey and their ability to remain unaffected by any human disturbances. Indicators of introduced predators were observed within each habitat zone. Evidence of bird kills and disembowelled wallaby carcasses is an indication of predator activity on the site.

Other introduced species were recorded present on the site. Large populations of rabbits thrived under the protection of Blackberry stands and with the good foraging resources of nearby pasture. Pig scats and digging were observed on the boundary of the agricultural lands and nearby one of the dams. It would be expected that feral pigs would only occasionally visit the site as required (ie. during dry periods or lean seasons), being able to more successfully inhabit the broad areas of bushland flanking the site.

The presence of introduced species is likely to have had an impact on native flora and fauna of the site. Smaller bird, mammal and reptile species are common prey to cats and foxes. Understorey and ground cover has been impacted by introduced grazing species. Areas close to the boundary of both habitat types have been impacted the most.

3.2.2 Frogs and Reptiles

Six species of frogs were identified during the survey. All of these species were recorded from dam sites or the open cut area containing water. All species recorded are regarded common to the region. The most active site for frogs was the larger depression towards the north of the old open cut. This site contained a good sedge community along with a shallow pool area. Located within a sheltered hollow, this water holding depression provided at least all six recorded species of frogs with adequate habitat. Dam sites surrounded by pasture-lands supported a very low frog population. This is due to very limited waters edge vegetation and the exposure that these sites have to predator species.

Drainage lines were also investigated for less water dependant frog species, however none were located. Tussock areas revealed no frog populations. Upper regions of some of the more defined gullies were traversed and surveyed. No populations were recorded from these areas.

The weather conditions at the time of the survey were considered suitable for reptile activity. Two species of snakes that frequent the area were identified. These include the Red-bellied Black Snake (*Pseudechis porphyriacus*) and the Copperhead (*Austrelaps superbis*). A third snake species was observed but not properly identified. The characteristics of this snake make it likely that the species was a Common Brown Snake (*Pseudonaja textilis*). The two identified species were located immediately adjacent to the sedge and pool area at the northern end of the old open-cut. These snakes were most likely attracted by the plentiful prey associated with the water pool. This along with quality shelter and refuge and large bare sunning positions made this a good reptile observation area. The possible brown snake species was observed amongst leaf litter in elevated open forest nearby an Elliott trapping line, east of the pasture land. The site's potential for harbouring snake species is limited only by available water and cover. The relatively open dams central to the pasture land are unsuitable for snakes due to lack of ground cover.

Lizards, skinks and monitor species were less common over the site with only three sightings of smaller skink species made within the elevated forest community. All species of skinks are common to the region. Particular searches were made for gecko and monitor species, however no sightings or traces were identified.

The threatened species, *Eulamprus leuraensis*, which has been recorded within the region, was not identified as occurring on the site. It is considered that more favourable habitat exists within the Central Blue Mountains. Known habitat for this species was closely investigated, especially in the vicinity of the sedge and pool area within the old open-cut.

3.2.3 Birds

38 species of birds were identified. All are considered common within the region. A good proportion of these species are common to areas with contrasting forest and agricultural communities. It is considered that without the contrasting habitat features of these two areas, bird population numbers would be significantly lower.

Previously cleared agricultural pasture land provided a broad cleared area which allowed for relatively easy location and identification of bird species. Many species of ground feeding birds were observed here with more timid species foraging close to the timbered border. Few bird species were observed within the cleared pasture lands at all times of the day or night indicating that the neighbouring timbered areas provide sheltering or alternate foraging resources. No

nocturnal bird species were recorded over this area. The one recorded raptor species, the Wedge-tailed Eagle, is likely to use these more open agricultural lands for foraging, especially with the high rabbit populations which occur.

The cleared and regenerating open-cut area provided a relatively diverse bird community mainly due to its proximity to water and refuge. The *Cassinia* shrub areas and briar communities on the disturbed workings provided smaller bird species such as fantails, wrens and robins with refuge. Pacific Black Ducks were seen on the ephemeral pool south of the old open-cut. These were the only aquatic species seen on the site. Species recorded within this habitat zone are more likely to be using the site as a watering area rather than for specific foraging or nesting requirements. The tree community in the old open cut area has not established hollows and has a poor quality lower stratum component.

The closely related habitat features of the tussock and sedge community and the tall standing eucalyptus forests were surveyed together for bird species. Diversity of species decreased with distance into the forest areas. However specific habitat and niches for certain species became more defined. The timbered areas of the neighbouring State Forest areas were observed to provide most of the recorded bird species with shelter, breeding or foraging habitat.

A high proportion of the hollow tree nesting sites exist within the forest. Those trees which were investigated during the survey showed evidence of being used by Blue-cheeked Rosellas or Galahs. A relatively large roaming flock of immature Rosellas was observed several times during the survey within the forest area. Crown dwelling species such as the White Plumed Honeyeater and the Noisy Friarbird moved freely and broadly throughout this forest. Yellow-tailed Black Cockatoo were heard calling from deeper into the forest areas as were Southern Boobook Owls. The owls were calling mainly from gully regions with one observed foraging over the tussock area to the east of the site which may illustrate the richer available small mammal prey in this area.

Within the region of the proposed development habitat has been altered by the pasture area, old open cut mining areas and the ingress of weeds into the forest area. Fringing areas between the cleared agricultural land and woodlands consist of greater disturbed habitat with these disturbances taken advantage of by those species more robust, competitive and adaptive.

More specific habitat was generally better and more abundant deeper into the forest areas. Good hollows higher up in eucalyptus trees, rock crevices and hollows, sandy banks and shrubby understorey nesting habitat was more abundant and of better quality outside of the site and deeper into the forested areas.

It is unlikely that the site presents any specific or unique habitat characteristics to any threatened species.

3.2.4 Mammal Species

Seven species of terrestrial and arboreal mammals were observed during the survey. All species being common to the region. The site provided many species with higher adaptivity to agricultural disturbances with good resources.

The agricultural pasture area served to provide many grazing native and introduced species with good foraging. Kangaroo and Wallaby numbers were very high over these areas. Evidence of heavy traffic from macropods into and out of the agricultural lands was observed with damage to fence lines bordering onto the forest area. Wombats were observed grazing on the pasture with runs extending from adjacent forest areas. One series of wombat runs is located on the western intercept of the forest and agricultural land.

The agricultural pastoral area provided poor habitat for many native species. This was evidenced by low trapping successes and lack of identifiable traces across this region. The cleared area does not have the potential to provide many forms of habitat or shelter resources. Smaller mammal species are vulnerable to predation across this cleared area.

The cleared and regenerating open-cut site provides a slightly better quality habitat range for small mammals due to a denser lower storey comprising of Cassinia and Black Berry Bushes.

Larger mammal species use this area to access the ephemeral waterholes and for greener pick which may occur in the moister depressions. The same larger mammal species recorded from the pasture areas were recorded within this habitat zone.

Smaller mammal numbers are likely to be low within this area. This conclusion was supported by a low trapping and trace detection success. Possible reasons for this result may include the location of the site, the configuration of the communities that make up the open cut area and the competition which may come from other introduced species.

The old open cut is located between a region of better habitat and an area of low quality habitat. Smaller native mammals are likely to seek and gain resources in the more diverse native forest with lower previous impacts. The agricultural lands are unlikely to be favoured by any significant small mammal species. The regenerating open cut area currently acts as a buffer between the state forest area and the pasture area on the south-eastern corner of the site.

The configuration of the woodland that currently exists on the open cut area is relatively young and lacks significant ground timber with hollows, hollow bearing trees, diverse ground cover and a diverse, established mid-storey. Without these components habitat becomes of lesser quality to a range of species.

Introduced species (ie. the rabbit) were recorded in very high numbers over this area. Such species were afforded good protection and shelter from Blackberry and dense Biddy Bush. The presence of high introduced populations is likely to out-compete other species for habitat resources.

The tussock and sedge regions located within the gullies and minor drainage depressions within the forest areas provided potential habitat for small mammal populations. The tussock areas on the site are typically made up of a dense ground cover of grasses and sedge species (with exception of the pasture areas) Trapping successes within the larger gully area to the east of the site indicated that a population of Brown Antechinus (*Antechinus stuartii*) exists here. This small native marsupial was also recorded from other gully regions where ground habitat was diverse and plentiful. The main gully to the east of the site yielded four separate captures over a total of 50 trapping nights. No other small native mammal species were recorded from these areas.

The community composition in this habitat zone is made up of a tall open canopy structure (>16 metres), low levels of significant ground timber and isolated or fringing mid storey vegetation such as young eucalypt saplings or native shrubs. Areas consistently indicating the presence of small native mammals were those tussock regions with larger ground logs present.

Larger mammals were noted within all tussock areas. Swamp and Red-necked Wallabies used these areas for grazing and late afternoon shelter. Wombats were observed along the main broader gullies to the east and appear to prefer the sheltered location and deeper soils for the development of runs and burrows.

Introduced predators including cats and a fox were observed in the tussock area to the east of the site and to the north west. The presence of these species may indicate the occurrence of small mammal species however rabbits make up a significant proportion of their diet.

The eucalypt dominated forest had a relatively sparse small mammal habitat. Larger grazing mammals potentially use this area for diurnal camps and shelter whilst coming onto the pasture areas to feed. Macropod camping areas were commonly observed around the lower fringe areas of the woodland. Areas further up slope were commonly criss-crossed by wombat and macropod trails. Evidence on clearer ground or in ant mounds that echidnas are present in numbers was observed throughout the forest areas.

Trees limbs and smooth tree bases were investigated for the marking scratches of possums or koalas. Scats and scratches from the Brush-tailed Possum were recorded within a tall standing Eucalypt community north of the site. Large hollows within larger eucalypts were present on the site and offered potential habitat to possums species.

Areas of the forest able to be accessed by State Forest roads have been impacted by fire-wood collecting. Large fallen logs in a number of locations to the northern and eastern portions of the site have been cut up and removed. Dead standing trees and ground logs have been cut on the slopes of the steep hill side to the west of the site. For the site's relatively isolated and poorly accessed nature, a large amount of dead standing timber has been removed from the site. As ground habitat in the form of hollow bearing logs is not prevalent, such impacts are likely to have had a significant impact to species that could potentially use them.

3.2.5 Microchiropteran Bats

All habitat zones were assessed for potential habitat for bat species and bat activity. Of these, the most active areas were those within close proximity to accessible water. Areas which were recorded to have a greater diversity of bat species were within the eucalypt forest with suitable flight paths.

The cleared agricultural lands contained little habitat resources for bat species. Hollow bearing trees are scarce and often used by more common bird species. Dam locations provide some bats with a watering site and early nocturnal foraging zones. Dams sites which were monitored indicated steady activity throughout the night which was made up of just one or two common species.

The previously cleared and regenerating old open cut site did not provide bats with good foraging or shelter requirements. Recorded bat calls in the open cut area to the southern end of the regrowth site were scarce. Activity in the immediate vicinity of the waterholes within the open-cut area was recorded as being slightly higher. This is likely to have resulted from the presence of insects over the vegetation associated with the waterholes. The old open cut site also presents a relatively sheltered area suitable for foraging zones. A very low number of suitable hollow bearing trees exist within this habitat zone. This indicates that the open cut site is unlikely to provide significant bat roosting habitat.

The tussock areas associated with drainage depressions and gullies along with the tall standing eucalypt dominated forests were treated together in the evaluation of bat habitat.

Generally within these zones roosting habitat was evenly distributed around the wooded areas of the site but become more abundant and diverse deeper into the forest areas.

Large hollow-bearing, tall-standing eucalypt trees within the forest and within tussocked gullies, often contained suitable hollows potentially able to accommodate several species' requirements. Often older and taller trees have horizontally opening spouts within or above an open canopy which many tree roosting species prefer. Large trunk hollows potentially provide caverns for colony

roosts. These trees became more abundant deeper into the forest areas, particularly along broader drainage depressions.

The fringe of the woodland bordering onto the open agricultural lands was expected to provide bat species with contrasting foraging zones. Bat recording equipment monitored an average of 2.5 times the activity along forest trail clearings and open gully areas than the fringing forest to agricultural zones. This data indicates that bat foraging activity over the subject site predominantly takes place within the forest and gully communities and that the intermediate forest fringes may not play as an important a role. Bat activity within the monitored forest and gully sites decreased significantly between the hours of 1 and 4 am. This may suggest that individuals travel deeper into the forest and State Forest areas as part of their nocturnal behavioural patterns. Similar activity frequencies were recorded from the agricultural and open-cut areas.

Species diversity remained similar across the entire subject site. No significant habitat was identified within any of the habitat zones during the survey and it is unlikely that any significant bat habitat exists on the site which does not exist within the surrounding woodland, agricultural country and cliff-lines. The site is in close proximity to many differing habitat types and resources for bat species. These bat species are likely to make use of both human made and natural habitat types (ie. a number of bat species recorded foraging insects attracted to the strong lights illuminating the nearby colliery [*Pers com.* G Muir, 1997]. Bat species were recorded using small wind formed hollows within the nearby cliff lines [Williams 1996]).

Five species of Micro chiropteran bats were positively identified over the subject site. It is expected that several more species (including threatened species) cover the area during foraging or nocturnal flights. Up to 14 species of bat have been identified as occurring in the local region. Previous research indicates that bat diversity is consistent with available tree hollows with bat numbers concentrated into forested areas [Williams 1997].

All recorded species within this survey are commonly recorded and have a widespread distribution throughout the region. No species recorded are listed in schedules 1 and 2 of the Threatened Species Act 1995.

Section 4.0

Fauna Assessment

4.1 HABITAT QUALITY AND POTENTIAL

Habitat quality can be defined as the value that a site possesses with regards to its habitat. It can be quantified through evaluation of habitat diversity, richness and how available this habitat is to species existing on the site. The habitat potential refers to the developing habitat characteristics that species could potentially use in the future.

The site has many characteristics of a previously disturbed system. Even areas within the woodland of the State Forest have been impacted by vehicular tracks, ingress of weeds and timber cutting.

The site has been subject to varying degrees of human usage which has included mining, clearing, grazing, forestry and dumping. Other factors may have indirectly effected the composition of the site such as modifications to fire and flooding regimes and introduction of feral species and the provision of more favourable conditions which influence native species populations (ie. wallabies and kangaroos feeding on improved pasture lands).

The cleared agricultural lands have the lowest habitat quality for a diverse range of species. The clearing practice has resulted in isolated trees and discontinuous corridors extending for short distances within the cleared area. Grazing has resulted in a cleared understorey while scarce ground logs and ground litter has resulted in very poor ground habitat diversity. Introduced fauna species are often more competitive and robust, forcing potential native species from the area. It is likely that both rabbits and introduced predators have impacted on species diversity across the cleared agricultural lands and into those areas of forest fringing the agricultural areas. Habitat potential for these areas is also low. The removal and degradation of understorey components extensively segregates the site from neighbouring habitat quality. Grazing disturbance has resulted in a broad dispersal of introduced pasture related species and woody weeds which have lowered the density of native grasses and herb species. Regrowth of native tree and understorey species has also been restricted as emergents are removed by stock grazing and trampling. Development of understorey components would require extensive management alterations and would be likely to take a significant period of time to become re-established.

The previously cleared and currently regenerating old open cut area also has limited habitat quality. Key habitat components such as hollow logs, dense leaf litter and hollow bearing trees are rare over this zone. Survey

findings show that species which are most able to make use of this area included reptile and amphibian species as well as introduced species such as rabbits. The availability of water at the old open cut and the proximity to nearby forest increases the habitat quality of the site. During drier summer months when these ponds are likely to dry out, species populations and diversity would be expected to drop significantly. Erosion of the exposed soil and ingress of woody weed and Blackberry are the main factors which currently reduce the habitat potential of the site.

The tussock and sedge areas within the forest and extending onto cleared agricultural land indicated a low to moderate habitat quality and possessed a mainly open upperstorey. These areas are open to any disturbances resulting from agricultural practice. Evidence from the fire history of areas to the north of the site indicated that these tussock areas have been completely impacted by previous fires and it is likely that a fire in these areas would eradicate any specific habitat associated with the tussocks.

Inspection of gully regions outside the subject site and deeper into the forest showed that similar tussock areas with an open upperstorey as found along the lower gullies are uncommon. In other areas inspected, gully vegetation was made up of a more mosaic layout of communities where tussock areas were limited to small clumps. Areas with a denser canopy support a much thinner tussock ground community often dominated by bracken (*Pteridium sp.*). Another notable difference between the two gully areas was the lower quantity of fallen timber containing hollows. The tussock areas within the site had low levels of ground timber, whilst similar gullies deeper into the State Forest area had a significant amount of large hollow bearing logs. The absence of ground logs within the survey areas is likely to lower the habitat quality of the area. It is likely that populations of less common species would not inhabit these tussock areas especially if the tussock community has been removed or impacted on by fire. All small mammal species caught in these areas were very common species with most captures made in the vicinity of fallen timber or where the tussock community became more diverse.

Habitat quality increases slightly further into the gully-forest areas, however these communities became less defined and were eventually replaced with a tall standing forest community associated with the deeper soils.

Main impacts to the tussock area include ingress of pasture and clearing related weed species, fire impacts, introduced animal damage through

burrows, grazing and trampling and lowered community diversity potentially brought about by clearing or past grazing.

Habitat potential for the main areas of tussock community is low as these areas in a more natural state are likely to decline and be replaced by a greater diversity of upper and lower storey species.

The tall standing eucalyptus dominated forest areas offers the highest habitat quality of the site. This is due the general diversity of available habitat within it and through its continuity with other, much larger expanses of similar woodland. Impacts have been brought about by clearing, introduced weed and animal ingress and by the proximity to cleared agricultural areas. Within the survey site habitat quality was moderate with those areas closer to cleared country and easily accessed by trails, regarded as having a lower habitat quality for significant species.

The existence of mature aged trees throughout this area provides potential for future hollow and ground log habitat. Sapling regeneration would provide for future continuation of this community.

As outlined within this report, habitat potential becomes greater further into the forest with a higher incidence of old-growth, hollow-bearing trees, more diversity in mid and understorey components, and less disturbance from already disturbed pasture and old mining areas.

4.2 ASSESSMENT

Fauna habitat which would be potentially affected by development includes areas of old and regenerating forest and associated communities and agricultural lands. The forest areas provide food and shelter resources for a moderately diverse fauna population. The major limitations to fauna species diversity are the past and continuing introduced disturbances, vegetation community diversity and poor habitat quality which occurs over areas of the site.

The National Parks and Wildlife Services' Wildata records of rare and threatened fauna listed seven threatened species as being recorded in the region. A review of bioclimatic and geographical range data yielded a further 32 threatened fauna species which have the potential to occur in the region. Based on specific habitat requirements, fourteen of these fauna species with the potential to occur in the region could use the site as sub-optimal habitat (assessment into the likelihood of occurrence on the site is tabulated in **Appendix B**. These include:

- Squirrel Glider (*Petaurus norfolcensis*)
- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*)
- Large Pied Bat (*Chalinolobus dwyeri*)
- Great Pipistrelle (*Falsistrellus tasmaniensis*)
- Little Bent-wing Bat (*Miniopterus australis*)

- Common Bent-wing Bat (*Miniopterus schreibersii*)
- Square-tailed Kite (*Lophoictinia isura*)
- Bush Thick-knee (*Burhinus magnirostris*)
- Glossy Black-cockatoo (*Calyptorhynchus lathami*)
- Turquoise Parrot (*Neophema pulchella*)
- Powerful Owl (*Ninox strenua*)
- Masked Owl (*Tyto novaehollandiae*)
- Regent Honeyeater (*Xanthomyza phrygia*)
- Painted Honeyeater (*Grantiella picta*)

None of these species were identified during this survey of the site. No species have been recorded within the locality of the site.

4.3 SEPP 44— KOALA HABITAT

State Environmental Planning Policy No. 44 — Koala Habitat Protection (SEPP No. 44) aims to:

“encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free living population over their present range and reverse the current trend of the koala population decline”.

Potential koala habitat is defined as:

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

Ecological reports for within a 40 kilometre radius of the study area indicate that areas nearby the study area have potential koala habitat as outlined within SEPP No. 44. The survey site is located within the Greater Lithgow Shire Council Government area. This area is listed under Schedule 1 of SEPP No. 44 and therefore the koala Habitat Protection Planning Policy applies to the study area.

The tall open forest which occurs on the site has a strata component of over 15% of listed feed tree species. This, along with the listed local government area makes the site potential koala habitat.

The closest koala sightings to the site include:

- 1994 — 8 km north-east within the Wolgan State Forest
- 1994 — 27 km east within the Newnes State Forest

Woodland similar to that found within the Wolgan State Forest exists on the site, however there are no known record of koalas occurring within the area of the site. No evidence of their scats, markings or calls were recorded from the site, even from a specific koala search comprising of two-half days. Whilst it is possible that koalas could and may use forests in the region, the areas surveyed indicate that there is no population existing on the site. The site is located on the western fringe of large expanses of woodland and forest. It has been fragmented from further bushland to the west by agricultural practices.

The survey revealed no features which distinguished the site as more favourable koala habitat than that found further into the State Forest areas.

It is unlikely that the proposed development would have a impact on any local populations of koala (if any) by disturbance of those areas within the study site.

Core koala habitat is also defined as:

“an area of land with a resident population of koalas, evidenced by attributes such as breeding females (ie. females with young) and recent sightings of and historical records of a population”.

There is no record of breeding females or evidence of a resident population in the study area. It is unlikely that a population could exist within the locality without detection.

The proposed development does not impact on the connectivity of surrounding forest, nor does it have the likelihood of isolating any area of potential koala habitat.

4.4 IMPACTS OF THE PROPOSAL

The development would directly impact on no more than 28 hectares of forest, agricultural and previously cleared old open cut woodland community.

Impacts would be restricted to those areas where suitable and viable coal can be extracted. The site surveyed for this report extended to the maximum possible areas which could be impacted directly by the proposal.

The majority of the proposed mining operations would be restricted to the lower slopes and gullies. Tall eucalypt dominated forest on the upper and steeper slopes of the State Forest would be conserved. The predominant impacts on habitat would occur mainly within the tussock areas associated with gully regions. The proposal may impact on the majority of these areas, removing the ground to upper-storey components of vegetation.

Impacts on the fauna on and in the immediate area of the open cut and access road would result in the removal of all habitat components. Features such as the pond area within the old open cut area which acts as habitat and watering point for

numerous reptiles, amphibians, birds and mammals would be retained. Any area deemed not viable for mining operations would be avoided and suitable runoff and sediment controls would be enforced to prevent further impact to neighbouring bushland.

Impacts upon fauna across the cleared agricultural area would be minimal. This area provides few habitat resources which are not available immediately adjacent to the site. The removal of small dams is unlikely to effect species within the area. Nearby dams are easily accessible by many species including kangaroos, bats and bird species. It is unknown to what extent the resident populations of wombat use these dams. Tracks at the dam edges did not indicate whether wombat were watering at these locations. No corridors or refuge islands would be impacted on by the proposal.

The proposed haul road across this habitat zone is unlikely to significantly impact fauna habitat availability or diversity for the locality. Disturbance from the haul road would predominantly impact cleared and partially cleared agricultural lands.

More important habitat within the previously cleared and regenerating open cut area is unlikely to be impacted on by the proposal. Areas of this zone would be avoided in the development of the open cut. Those areas likely to be impacted by the proposal do not constitute significant habitat for threatened species. No habitat would be removed from the old open cut site which could be unique to the area or presents important habitat resources for species occurring in the area.

Depending on the extent that the works would extend, habitat within the tussock and sedge areas of the gully are the most likely to be impacted. These areas provide a more complex form of habitat in the area which provides resources for a range of common species. Due to the location of these tussock areas, impacts from the cleared agricultural land and activity within the forested areas have lowered the habitat quality. The sparsity of similar communities within more natural sites in the locality, indicates that the presence of denser tussock and sedge lined dry gullies may be partially caused by human disturbances (ie. clearing, drainage and fire regime modifications). Better quality habitat exists further up these gullies with a greater number of ground logs and broader habitat diversity. It is unlikely that the proposed development would impact on significant habitat or lower biodiversity within these areas. No habitat which is unique to the area or presents important habitat resources is likely to be removed from the tussock and sedge gully areas.

Impacts to habitat within the tall standing eucalypt dominated forests would occur predominantly on the lower slopes and lower gully floors. These impacts would be dependent on coal availability. Main habitat components within this community are larger hollow bearing trees and hollow bearing ground logs. Both of these habitat types are more common as distance into the forest areas increases. The survey indicated that more common or robust fauna species make the greatest use

of this habitat zone. It is expected that rarer species make greater use of those areas less disturbed by agricultural or past mining practices. No threatened species were identified as using the site for habitat. No indicators to the presence of any threatened species were observed.

From data obtained within the survey and through other recorded data sources, it is considered that no threatened species would be impacted by the proposed development.

4.5 AMELIORATION

The following amelioration measures would be employed to mitigate potential impacts on flora and fauna.

- In the construction of the haul road, healthy, mature and potential hollow forming trees would be retained.
- Implementing appropriate soil conservation practices including control and appropriate redirection of surface runoff, adequate revegetation of disturbed areas and maintenance of revegetation to minimise impact on vegetation through further loss of topsoil.
- Use of cleared vegetation material to assist in providing mulch and seed sources for stabilisation and regeneration areas. Large hollow logs would be stockpiled and replaced after the completion of works in order to provide smaller terrestrial species with suitable ground habitat.
- Maintenance trails which need to be formed within the forest above the open-cut site would be kept to a minimum.
- Fresh water dams or ponding areas adjacent to the open-cut site would be protected from contaminants or disturbance. This would ensure that watering sites for native fauna would remain intact and unpolluted.
- Wherever possible rehabilitation of previously mined areas would take place progressively, ensuring that by the finalisation of works, differing aged habitat is available to fauna species.
- Upmost care would be taken when removing or disturbing known habitat (ie. significant bird hollows, wombat burrows) These sites should be first identified and inspected, and if necessary fauna removed in a manner that minimises harm to the animal.

Section 5.0

Conclusion

The level of habitat removal would be dependant on the extent of workings carried out by the proposed open-cut activity. This is directly related to the quality and quantity of coal which can be obtained viably from existing underground operations and could involve disturbance to up to 28 hectares.

The diversity of the species over the area is moderate. A number of species exist due to the extensive areas of neighbouring forest. More common species use the fringe relationship between forest and cleared agricultural land.

The proposed open-cut would result in the loss of an area of open grazing land along with a semi- circle shaped region of forested country. Lower lying habitats within this forested country would be more subject to mining disturbances than more elevated areas.

Habitat associated with previously cleared or mined land is generally low to moderate quality with a low number of species specifically relying on the habitat characteristics of these areas. A number of exotic species have invaded these disturbed areas. The disturbance of this habitat is considered likely to have compromised the ecological value for any threatened species.

Habitat associated with the forest extending from and including that within the Ben Bullen State Forest, consists of moderate to good habitat. Habitat quality was generally found to increase in quality away from areas neighbouring cleared land. The maximum area of forest fauna habitat to be impacted by the proposal is less than 20 hectares. The disturbance of this habitat is considered unlikely to have a significant effect on any threatened species. Forest habitat of similar and better quality would remain available immediately adjacent to the proposed disturbed areas.

No unique or important habitat would be lost due to the proposed open-cut. Ameliorative measures implemented during and after the works would help ensure that impacts are managed suitably.

The proposal is not likely to have a significant effect on any threatened species, populations or ecological communities or habitat, and consequently, a Species Impact Statement is not required.

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