Abel Ecology

Flora and fauna assessment report

for

94-100 Explorers Way St Clair
Lot 36, DP 239502

Proposed residential subdivision

Date: 2 June 2015
Document No: 1424-REP-66-ISS-1
Prepared for: Silky Constructions
Prepared by: Abel Ecology

PO Box 495
Unit 2, 10-11 Ferguson Road
Springwood NSW 2777

T (02) 4751 9487
F (02) 4751 9488
E info@abelecology.com.au
www.abelecology.com.au

Abel Ecology Pty Ltd
2 Samuel 20:18 ACN 079 079 762 – ABN 72 516 253 751

Disclaimer

This report has been prepared in accordance with the scope of services described in agreement between Abel Ecology and the Client.

In preparing this report, Abel Ecology has relied upon data, surveys and site inspection results taken at or under the particular time and or conditions specified herein. Abel Ecology has also relied on certain verbal information and documentation provided by the Client and/or third parties, but did not attempt to independently verify the accuracy or completeness of that information. To the extent that the conclusions and recommendations in this report are based in whole or in part on such information, they are contingent on its validity. Abel Ecology assumes no responsibility for any consequences arising from any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to Abel Ecology.

The findings contained in this report are the result of discrete/specific methodologies used in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site in question. Under no circumstances, however, can it be considered that these findings represent the actual state of the site/sites at all points.

Any representation, statement, opinion or advice, expressed or implied in this publication is made in good faith but on the basis that Abel Ecology, its agents and employees are not liable (whether by reason of negligence, lack of care or otherwise) to any person for any damage or loss whatsoever, which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in respect of any representation, statement, or advice referred to above. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client.

Furthermore, this report has been prepared solely for use by the Client. Abel Ecology accepts no responsibility for its use by other parties.

Document history

Report	Version	Prepared by	Checked by	Submission	
				Method	Date
Draft report	Draft A	Jesse Tree	Dr Danny Wotherspoon	Email	11 May 15
Final report	Issue 1	Jesse Tree	Venetia Keane	Email	2 Jun 15

Table of Contents

Table of Figures

Table of Tables

List of Abbreviations

APZ	Asset Protection Zone
CPW	Cumberland Plain Woodland
EEC	Endangered Ecological Community
ESD	Ecologically Sustainable Development
IPA	Inner Protection Area
LEP	Local Environmental Plan
LGA	Local Government Area
PDA	Principal Development Area

Note regarding maps in this report

The diagrams/site maps used in this report have been supplied by and are used with the permission of Silky Constructions.

With regard to maps provided by the Land Information Centre, Topographic maps used with the permission of © Land and Property Information, NSW.

Figure 1. Locality map for 94-100 Explorers Way, St Clair

Site location

「 Land and Property Information NSW. Spatial Information eXchange (SIX) website 2015.

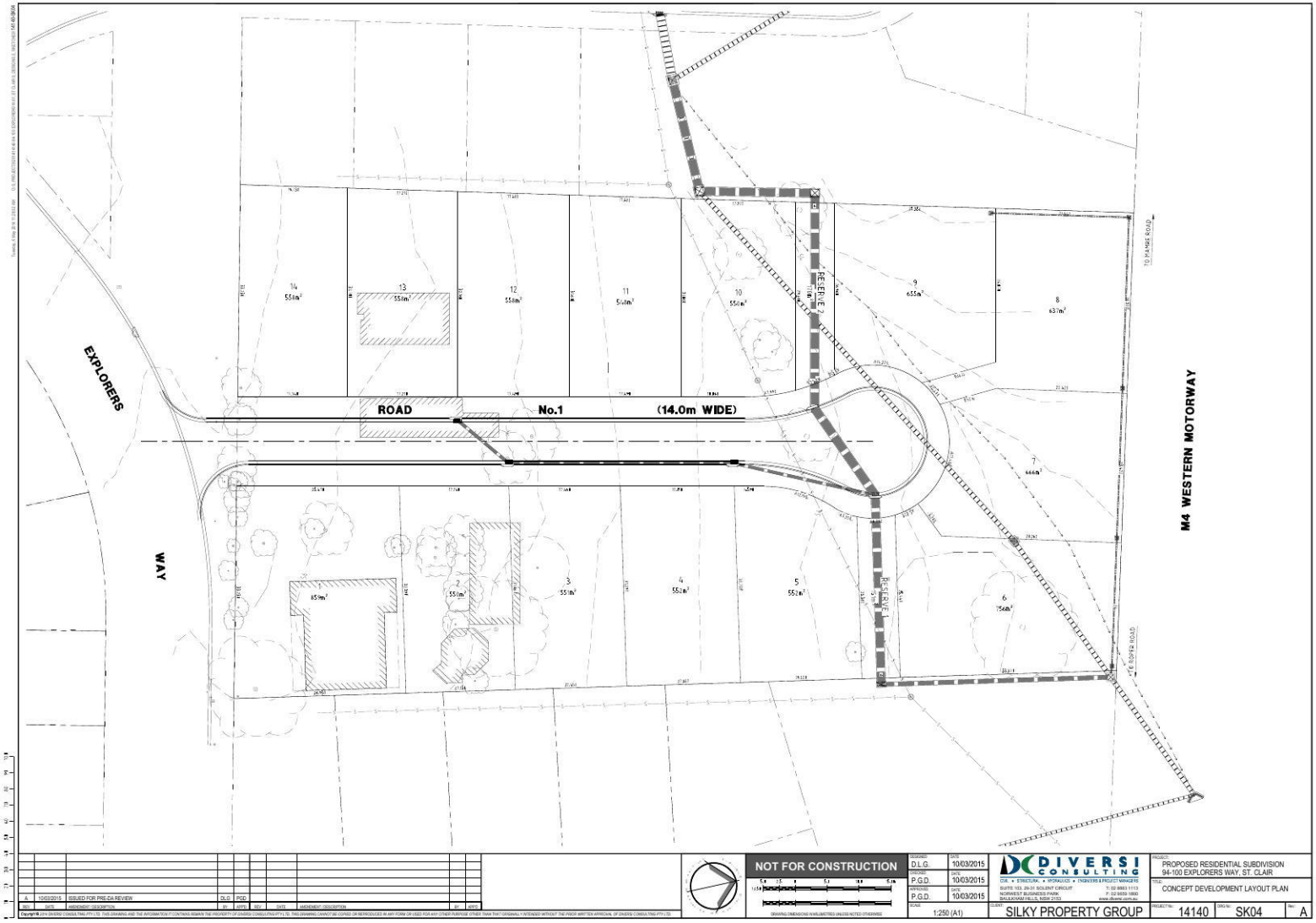


Figure 2. Proposal Diagram

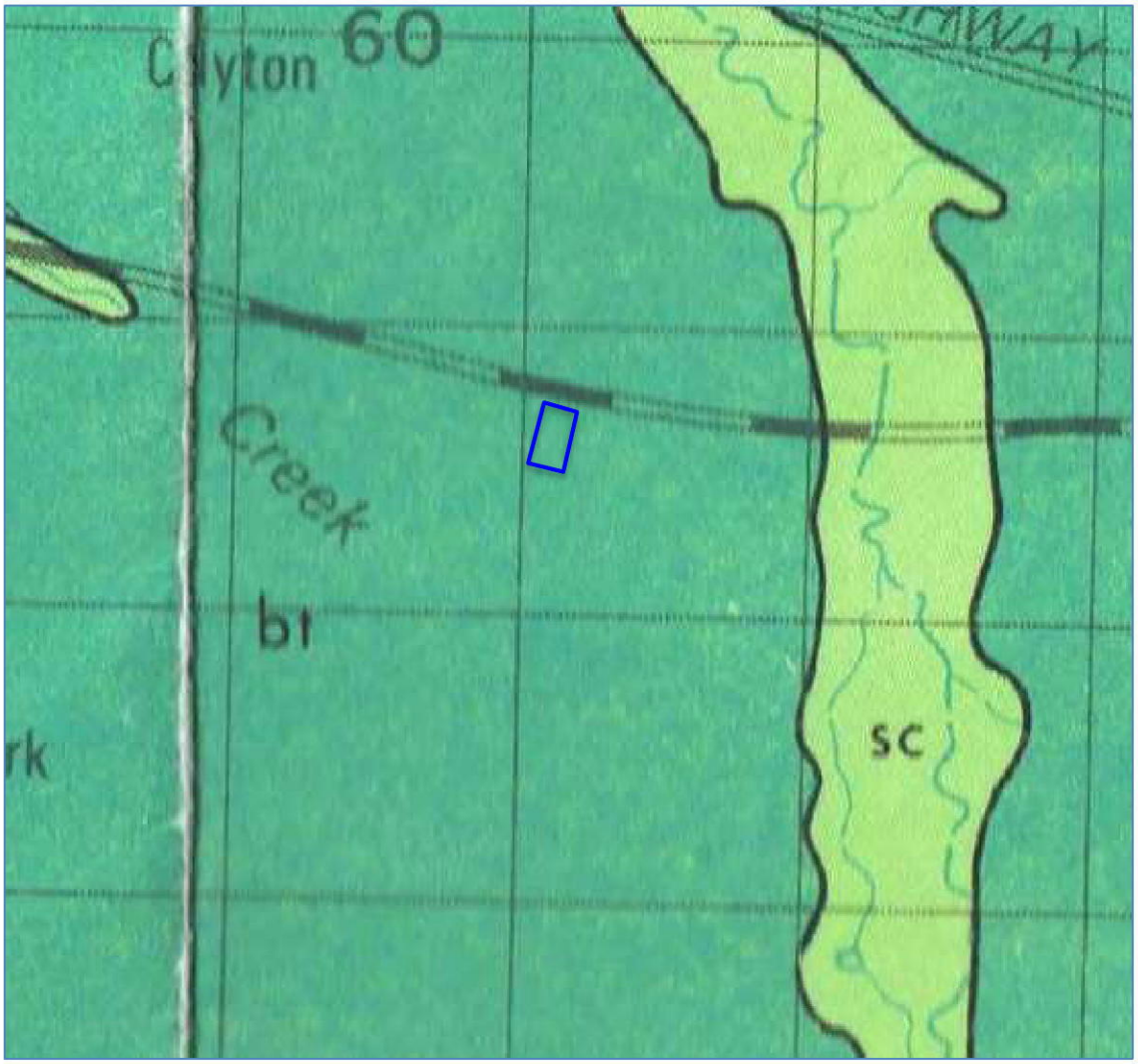


Figure 3. Soil map for site and surrounding area

Approx. site location **Scale:** grid square = 1 km

KEY

RESIDUAL

bt (Blacktown) - Gently undulating rises on Wianamatta Group shales.

FLUVIAL

sc (South Creek) - Floodplains, valley flats and drainage depressions of the channels on the Cumberland Plain.

Source: Soil Conservation Service of NSW Soil landscape series sheet 9030, Penrith, 1989.

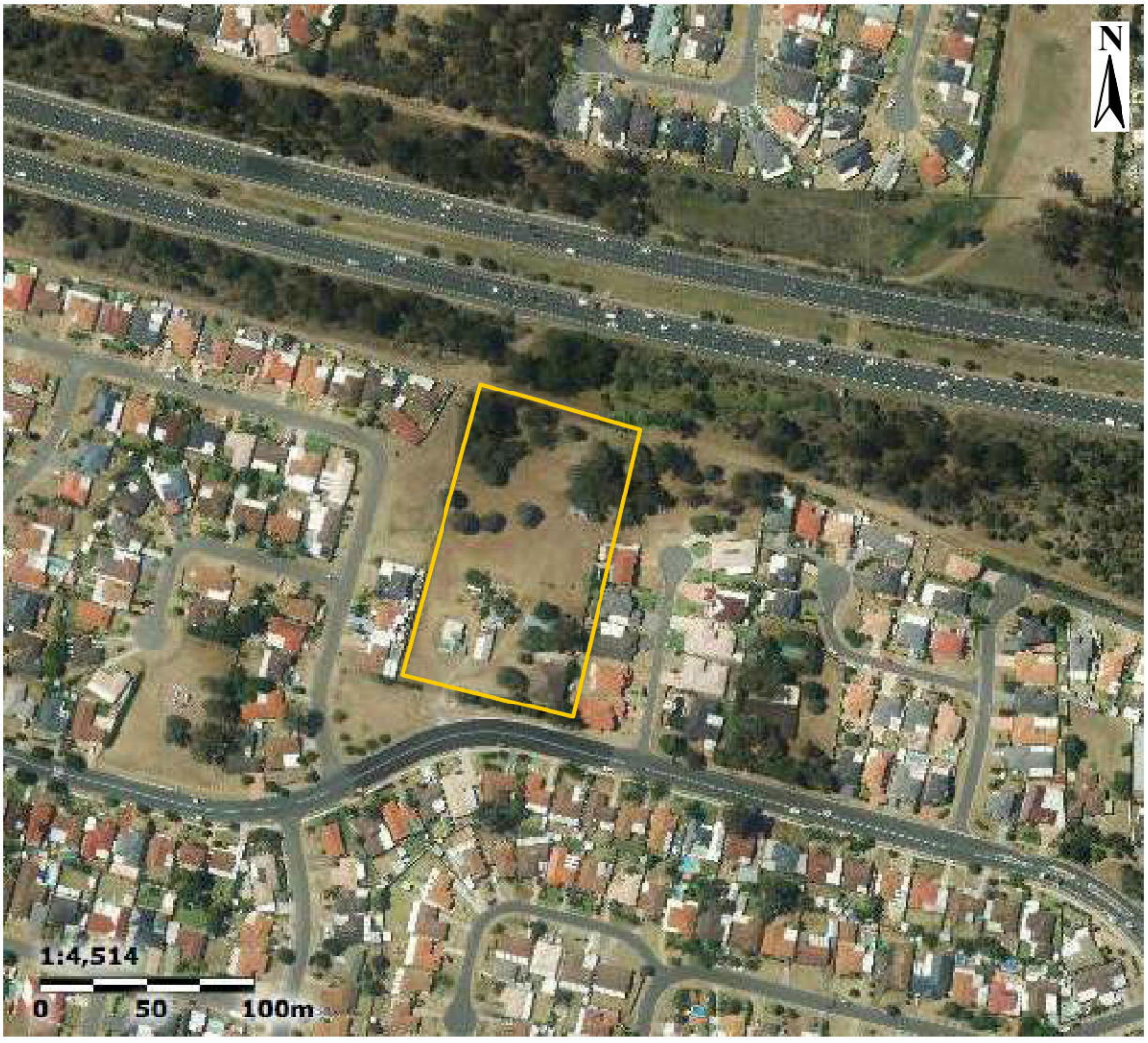


Figure 4. Air photo of the site and local area

Site location

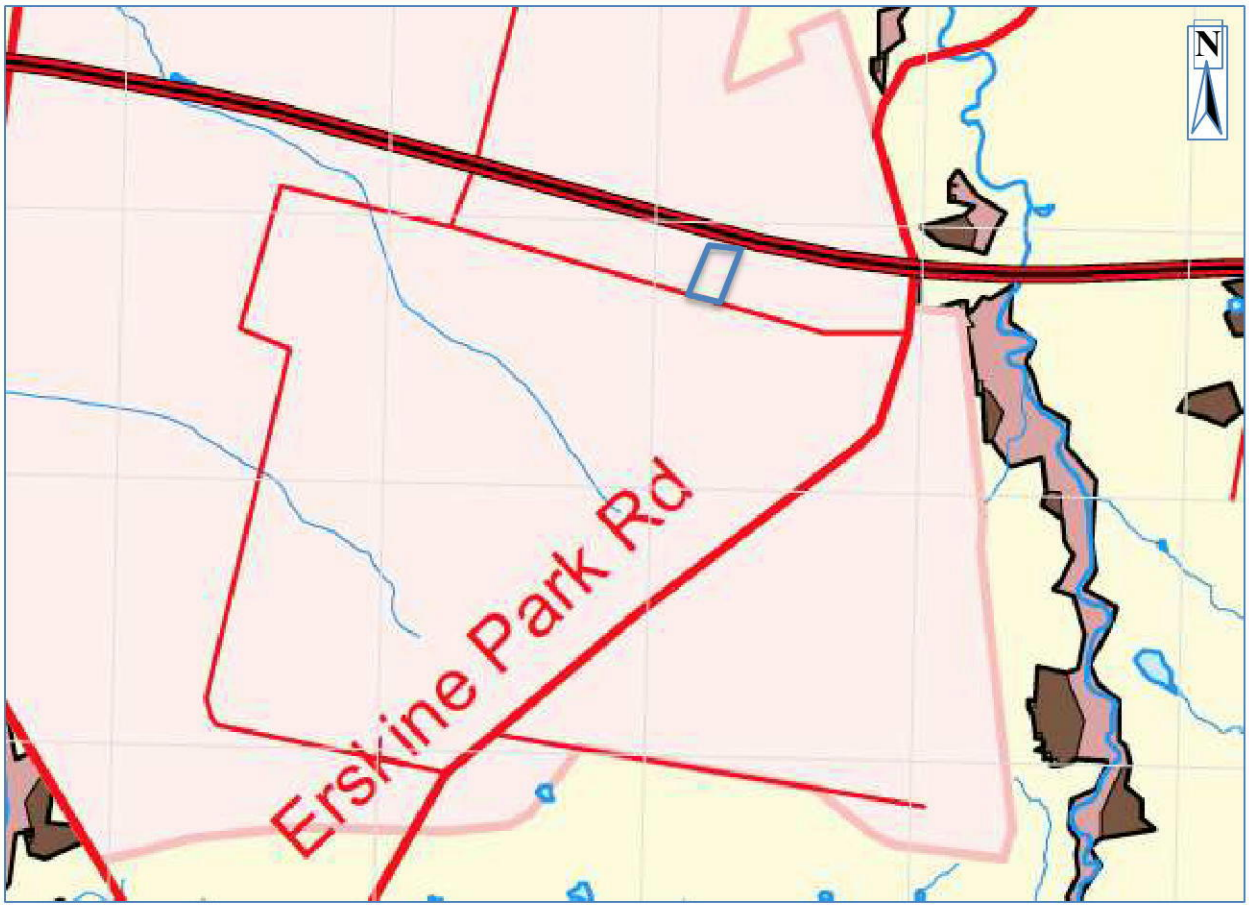


Figure 5. Vegetation map for the site and surrounding area

Site location

Scale: grid square = 1 km

Cumberland River Flat Forest

Modified or disturbed land

Cumberland Shale Plains Woodland

Source Map: M.G. Tozer *et. al* (2010) Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands, Penrith vegetation map.

Figure 6. LEP zone map for the site and surrounding area

Site location

Key

R2	Low Density Residential
R3	Medium Density Residential
R4	High Density Residential
R5	Large Lot Residential
RE1	Public Recreation
SP2	Infrastructure

Figure 7. Vegetation survey map

Key

QA	Quadrat sites

Executive Summary

The proposal is to subdivide a 1ha property into a residential subdivision development.

A flora and fauna survey was carried out at 94-100 Explorers Way, St Clair to assess the likely impacts of development on species present on the site, and whether there is likely to be any significant effect on any endangered ecological community, endangered population, threatened species or their habitats, as per the listings in the Threatened Species Conservation Act 1995 (TSC Act 1995) (state legislation), the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999) (Commonwealth legislation) and other applicable local or regional policies.

The site has been cleared of understory vegetation for several decades, most likely since the surrounding area was subdivided. Vegetation on the site consists of mown lawn and remnant trees. The site provides habitat for common bird species.

Table 1. Endangered ecological communities, threatened flora and/or fauna species, locally significant species found on the site.

Species/ Communities	C'wealth listing EPBC Act '99	State listing TSC Act '95	Local listing	Result
Shale gravel transition forest in the Sydney Basin Bioregion	Critically Endangered	Sch. 1 Endangered	-	No significant effect

Shale gravel transition forest in the Sydney Basin Bioregion was present as degraded remnants of Class 3 condition but does not meet any threshold criteria to be regarded as a community.

The provisions of the EPBC Act 1999 apply to this proposal. The outcome is not significant however, and does not require referral to the Commonwealth.

There is no impediment to this proposal in the scope of this report. There is not likely to be a significant effect on any endangered ecological community,

threatened species or their habitats. A Species Impact Statement is not recommended.

Recommendations for this proposal include:

- All storm water that leaves the site is to be treated by a gross pollutant trap or better to meet water discharge standards.

Special considerations

a) Site vegetation conditions detailed in this report are subject to change over time due to various factors, e.g. germination from seed bank, bushfire, storms etc. It is recommended that this report be submitted within 6 months, after which further fieldwork may be required.

1. Introduction

A fauna and flora survey of the proposed development site at 94-100 Explorers Way St Clair ('the site' – Figure 1) was undertaken on 17th and 24th April 2015.

The main aim of this survey was to determine whether the present proposal is likely to cause a significant effect on any endangered ecological community, endangered population, threatened species or their habitats. This assessment is based on the seven factors listed in Section 5A of the Environmental Planning and Assessment Act 1979, no. 203, (as amended), which are specifically addressed in Section 8.4 and Appendix 1 of this report.

This assessment addresses both 'endangered' and 'vulnerable', as required by the Threatened Species Conservation Act, 1995 (TSC Act 1995). Throughout this report 'threatened' refers to those species and communities listed as 'endangered' or 'vulnerable' in Schedules 1 & 2 of the TSC Act 1995. 'Protected fauna' refers to any native bird, mammal (except the dingo), reptile or amphibian in NSW.

Other planning instruments addressed include Planning for Bushfire Protection.

2. Description of the proposal and the site

2.1 The proposal

The proposal is to subdivide an existing lot into 14 residential lots (Figure 2). The existing residential property on the site will be retained. All other buildings will be demolished to enable construction of 13 additional low density residential properties which consists of:

a) Subdivision as R2 low density residential use
b) Road
c) Driveways
d) services to the Lots
e) link up to sewage system
f) utilities within the lots

2.2 Site description

For the purpose of this report the site is defined as Lot 36, DP 239502, 94-100 Explorers Way, St Clair (Figure 1). It is approximately 1.06ha in size and the elevation is approximately 60m above sea level.

Domestic garden plantings include various edible fruit bearing trees, being pomegranate, citrus, stone fruit trees. Lawns are composed of a mix of low-growing herbaceous local natives, common couch, and kikuyu.

The Western Motorway (M4) is immediately north of the site, and residential properties occur west, east and south.

The site is generally level. The site receives water runoff from the Western Motorway. Local drainage is piped to run under the Motorway.

Stormwater on site runs across the site to the northeast corner and then under the Motorway. Part of the drainage line becomes waterlogged and holds water in times of high rainfall.

Adjacent land to the east and west is zoned RE1 Public Recreation (Figure 6).

The vegetation is described in detail in Section 5.1 below and fauna habitat is detailed in Section 4 below.

2.3 History of the site

The site is an old subdivision that has been cleared of understory vegetation. Exotic grasses such as Common Couch have spread across the site and the former herbaceous layer has been maintained as a mown lawn.

2.4 Geology

The geology on the site consists of Triassic deposits, in the Wianamatta Group, of sandstone and shale (Brunker *et al*., 1967).

2.5 Soils

Original soils are of the Blacktown type in the Residual Group (Figure 3). They are shallow to moderately deep hard setting mottled texture contrast soils, red and brown podzolic soils on crests grading to yellow podzolic soils on lower slopes and in drainage lines. (Hazelton *et al*., 1989).

The site has been cleared and graded so most of the site has disturbed soil.

3. Methodology

3.1 Literature review

Literature reviewed in order to assess possible issues relating to this site include:

Air photo SIX viewer (Figure 4)
Survey map
Vegetation map (Cumberland Plain/Tozer et al.) (Figure 5)
Schedules to the TSC Act 1995
Schedules to the EPBC Act 1999
OEH Atlas of NSW Wildlife

Other flora and fauna surveys and tree reports in the local area, including:

Wotherspoon, A. D. (2004). SULE Report for 80-82 Newton Road, Blacktown, Proposed Townhouses. Faulconbridge, Blue Mountain Wilderness Services Pty. Ltd.

Abel Ecology (2008) *Site tree inspection report for cnr St Mary's and Richmond Roads, Berkshire Park*, Abel Ecology, Faulconbridge.

Abel Ecology (2009). Vegetation Management Plan for Light Horse Business Centre, Archbold Road, Eastern Creek, for Proposed Resource Recovery and Landfill Facility. Faulconbridge, Abel Ecology.

Abel Ecology (2009). Statement of Environmental Effects for Glenwood Reserve, Blacktown, Proposed playing field construction. Faulconbridge, Abel Ecology.

Abel Ecology (2010). Flora and Fauna constraints report for Blacktown Hospital. Faulconbridge, Abel Ecology.

Abel Ecology (2011). Seven-part test for Cumberland Plain Woodland at Blacktown Hospital. Faulconbridge, Abel Ecology.

Abel Ecology (2012). Safe Useful Life Expectancy tree report for proposed new clinical building at Blacktown Hospital. Springwood, Abel Ecology.

Abel Ecology (2012). Flora and fauna assessment report for Tregear Reserve, Blacktown, Proposed drainage line installation. Springwood, Abel Ecology.

Threatened species recorded in the locality, being within a 10km radius of the site, include both flora (Table 2) and fauna (Table 3). An assessment of habitat for these species is shown in Appendix 5 and Appendix 6.

Table 2: Locally occurring threated species flora

Scientific Name	Common Name	NSW status	Comm. status
Marsdenia viridiflora subsp. viridiflora	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	E2	
Dillwynia tenuifolia		V,P	
Pultenaea parviflora		E1,P	V
Acacia pubescens	Downy Wattle	V,P	V
^^Hypsela sessiliflora		E1,P,3	X
Micromyrtus minutiflora		E1,P	V
Grevillea juniperina subsp. juniperina	Juniper-leaved Grevillea	V,P	
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	V,P	V
Persoonia nutans	Nodding Geebung	E1,P	E
Pimelea spicata	Spiked Rice-flower	E1,P	E

Table 3: Locally occurring threated species fauna

Scientific Name	Common Name	NSW status	Comm. status
Litoria aurea	Green and Golden Bell Frog	E1,P	V
Ephippiorhynchus asiaticus	Black-necked Stork	E1,P	
Hieraaetus morphnoides	Little Eagle	V,P	
^^Lophoictinia isura	Square-tailed Kite	V,P,3	
^^Ninox strenua	Powerful Owl	V,P,3	
Anthochaera phrygia	Regent Honeyeater	E4A,P	E
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V,P	
Daphoenositta chrysoptera	Varied Sittella	V,P	
Petroica boodang	Scarlet Robin	V,P	
Phascolarctos cinereus	Koala	V,P	V
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V
Mormopterus norfolkensis	Eastern Freetail-bat	V,P	
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P	
Miniopterus australis	Little Bentwing-bat	V,P	
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V,P	
Myotis macropus	Southern Myotis	V,P	
Scoteanax rueppellii	Greater Broad-nosed Bat	V,P	
Meridolum corneovirens	Cumberland Plain Land Snail	E1	

3.2 Field work

Over the 2 days of fieldwork, a total of 19.33 hours were spent undertaking survey work on the site and surrounding habitat areas.

Table 4. Survey dates and weather conditions

Date	Times	Weather (˚C)	Task	Hours (hrs x no. people)
17 Apr 15	9:00 – 16:15, 10:00 – 16:15	19˚C, overcast, raining	Tree survey Flora and Fauna	(7.25 + 6.25) = 13.5
24 Apr 15	9:20 – 13:40 10:30 – 12:00	24˚C, still, fine, sunny	Tree survey Flora and Fauna	(4.33 + 1.5) = 5.83
			Total	**19.33 hours**

Survey effort was concentrated within the site boundaries, although adjacent surrounding vegetation was noted (Figure 5).

3.3 Fauna survey

The condition and location of the site are such that no targeted fauna survey was required for most species in the wider locality. However a hand search for Cumberland Plain Land Snail was made.

3.4 Flora survey method

A flora survey was conducted to compile vegetation descriptions and species lists for the site. A random walk was conducted over the site to compile a plant species list (Cropper 1993). As the site is predominantly mown lawn. Additionally three ground level quadrats of 1m x 1m (Figure 7) were sampled to include information to indicate the vegetation community for the plant herb layer. No threatened flora species were recorded on site.

Class System for vegetation quality

Vegetation communities may be classified according to the grading system developed by Perkins for Cumberland Plain Woodland, and outlined by Berzins (1999). The Class system may also be used as the basis for classification of other vegetation communities and is used in this report in the description of the on-site vegetation.

Three main classes of vegetation quality are recognised, together with cleared and previously cleared areas constituting a fourth class. There is variation within each class, and in addition the class boundaries are somewhat fluid where one grades into the other.

CLASS 1 - areas consist of remnant or regenerating areas with a range of indigenous species and are representative of the description for the specific vegetation unit involved. Natural soils still dominate, and weed invasion is relatively minimal.

CLASS 2 - remnants and regenerating areas with a range of native canopy species, but with reduced native understorey and groundcover layers by comparison to Class 1.

CLASS 2 REGENERATING - similar to Class 2, but in the primary stages of regeneration after disturbance. Native understorey and groundcovers may be present, but assessment over time is needed to determine the abundance or otherwise of these species.

CLASS 3 - areas with a range of canopy species but native understorey and groundcover is generally absent. Weeds may be present, sometimes as dense cover. Natural soils are either absent or have been intensively and/or repeatedly disturbed. This Class does not meet the condition in the Final Determination that an area is likely to achieve a near-natural structure or a seral stage towards that structure under natural processes.

3.4.1 Diurnal fauna searches

Searching, opportunistic observations and call recording provides an indication of types of species using a site. These methods are used to identify and record live animals, or record indirect evidence of animal presence on the site. On occasions, specific surveys may be conducted for a targeted group or species, such as searching the margins of a dam for frogs. Generally though, birds, reptiles, frogs and mammals, or evidence of them, may all be present in the same habitat at the time of survey, therefore searching for these faunal groups is generally run concurrently. This involved:

a) Opportunistic observations and identification of calls of species, and search for indirect evidence such as nests, feathers, scratchings and feeding signs for birds.

b) Searching for Cumberland Plain Land Snail by combing leaf litter with a metal rake, and turning building materials lying on the ground.

Bird surveys are used as a simple indicator of other parameters, such as biodiversity and the functioning of the ecosystem.

3.5 Species likely to occur

Species to be listed as 'likely to occur' or 'expected' (see Appendix 4), are common species generally found in the region, which are likely to occur on site if suitable habitat is present.

Native flora may include species local to the area (occurring in local remnants). Structure and species composition will depend upon locally occurring communities.

Expected species are common and, by definition, are not threatened species.

3.6 Limitations of the survey

This survey was conducted in the Autumn season.

Species that may use the site were not detected during the survey for the following reasons:

a) The species use the site at other times of the year, but was not present during the survey due to being nomadic or migratory.

b) The species were not detected due to being nocturnal or cryptic in habit.

4. Survey Results: Habitat

4.1 Site habitat description

The site was originally cleared of understory vegetation for residential use. Some indigenous trees have been retained and the ground has been maintained as a mown lawn. Native creepers and some low herbaceous species continue to grow on the site, however the majority of native species have been removed.

Dense stands of Melaleuca trees and several eucalypts exist on the northern half of the site. The site is fenced, however the canopy loosely connects with planted native vegetation adjacent to the motorway.

4.2 Specific habitat features

Important habitat features that have significance for fauna occupation of the site are discussed below. These include both site disturbance and natural features.

Two large Eucalypts occur on the site, however no tree hollows were observed in these trees or on the site. No habitat trees were observed on the site.

Food resources	Eucalyptus, Melaleuca, and Acacia.
Vegetation layers and density of cover	Presence of leaf litter on north boundary, Canopy cover = 20% of site, shrub layer is absent and herb layer is mostly exotics.
Clearing	Mown lawn, disturbed
Fire damage and regrowth status	No history of fire apparent.
Vehicle traffic	Residential road

4.3 Off-site habitat

Off-site habitat is poor or lacking. East, south, and west of the site are residential properties which offer minimal habitat. North of the site is a mix of planted natives adjacent to the motorway.

5. Survey Results: Flora

5.1 Vegetation description

The site contains a mix of remnant native trees, endemic herb species, exotic and native weeds, and exotic trees (Appendix 3). Of the 49 herb species on site there are 17 local native species (35%) and 32 weed species (65%). There is a total of 24 native species on site of which ten species are indicators of Shale Gravel Transition Forest (Tozer *et al.* 2010, page 623). For the purpose of

this report common couch *Cynodon dactylon* is regarded as a local native species as per the NSW Royal Botanic Gardens Herbarium. http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&search=yes&namesearch=cynodon+dactylon&dist=

The composition of the herb layer is less than 50% native species by cover and by composition, with three species of 13 recorded (13%) in three 1m^2 quadrats (Table 5).

Table 5: Herb layer quadrat species list

Species	Quadrat A	Quadrat B	Quadrat C
Conyza bonariensis*			X
Cynodon dactylon	X		
Cyperus gracilis		X	
Digitaria sanguinalis*			X
Ehrharta erecta*		X	X
Einadia trigonos		X	
Paspalum dilatatum*	X		
Pennisetum clandestinum*	X		
Sida rhombifolia*		X	X
Soliva sp.*	X		
Taraxacum officinale*	X		X
Verbena bonariensis*	X		
Veronica sp.*	X		

The majority of trees on the site occur in stands on the north side of the site. These trees are predominantly *Melaleuca decora*. The overall condition and vitality of these close-growing trees is adversely affected by the canopy competition that occurs between them. Little or no recruitment of new trees within the *Melaluca* stands has occurred due to understory clearing. The trees that were not originally cleared along with the shrub layer have grown tall and thin, typically without branches in the lower canopy.

The vegetation community on site is disturbed, but appears to best match the ecological community Shale Gravel Transition Forest in the Sydney Basin Bioregion. The patches of Shale Gravel Transition Forest on site are of Class 3 vegetation quality.

Appendix 3 shows the list of flora found on the site.

5.2 Species and communities of conservation concern

Shale Gravel Transition Forest in the Sydney Basin Bioregion occurs on site as a Class 3 condition remnant. However this is a conservative assessment since it does not reach the threshold (Tozer *et al.* 2010, page 622) by species composition to be regarded as an intact remnant.

> "A 0.04ha plot located in this Map Unit is expected to contain at least 25 positive diagnostic species (95% confidence interval) provided that the total number of native species in the plot is 37 or greater."

The total area of the site is approximately 1.06ha. The total area (Table 6) of the local occurrence of *Shale Gravel Transition Forest in the Sydney Basin Bioregion* is 3,958m^2 and within the site is approximately 1,908m^2. The remaining area is approximately 2,050m^2 or 52% of the local occurrence and is a Public Recreation reserve (Figure 6) so is secure tenure.

Table 6: Local occurrence of Shale Gravel Transition Forest

Location	Area (m^2)	Percentage of total
Area on site NW	1315	33
Area on site NE	593	15
Area off site NE	2050	52
Total local occurrence	3958	100

5.3 Disturbance and weeds

Noxious weeds on the site include:

Bridal creeper	Asparagus asparagoides	Class 4

This species is present in small numbers, typically occurring in shade beneath the stands of Melaleuca trees

Weed Control Classes

Class 1 - State Prohibited Weeds. "*The plant must be eradicated from the land and the land must be kept free of the plant*."

Class 2 - Regionally Prohibited Weeds. "*The plant must be eradicated from the land and the land must be kept free of the plant*."

Class 3 - Regionally Controlled Weeds. "*The plant must be fully and continuously suppressed and destroyed.*"

Class 4 - Locally Controlled Weeds. "*The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.*"

Class 5 - Restricted Plants. "*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.*"

Control objectives

The control objectives for each class is as follows:

Class 1 is to prevent the introduction and establishment of those plants in NSW.

Class 2 is to prevent the introduction and establishment of those plants in parts of NSW.

Class 3 is to reduce the area and the impact of those plants in parts of NSW.

Class 4 is to minimise the negative impact of those plants on the economy, community or environment of NSW.

Class 5 is to prevent the introduction of those plants into NSW, the spread of those plants within NSW or from NSW to another jurisdiction.

Class 5 weeds are predominately weeds listed under the old Seeds Act, which has been repealed. There is no obligation to control Class 5 weeds. However Class 5 weeds are notifiable weeds. This means that the plant, or any animal or thing, which has the weed on it or in it, cannot be sold, purchased or offered for sale in NSW. It cannot be removed from any land to another place and it cannot be scattered on land or water.

6. Survey results: Fauna

6.1 Species of conservation concern

The condition and location of the site are such that no targeted fauna survey was required for most species in the wider locality.

6.2 Fauna results

A total of seven (7) bird species were detected. Species listed as 'likely to occur' in the area are presented in Appendix 4. Note that the majority of the 'Expected Species' would not occur on the site due to the lack of habitat, but do occur in the area. All the species listed as 'likely to occur' are common throughout the locality and the region. It is unlikely that protected species will be affected at a local, regional or state-wide scale by the proposal.

The habitats for threatened species that occur in the area are tabulated in Appendix 5.

Table 7. List of fauna detected on the site

Common Name	Scientific Name	Conservation Status	Recorded AE
Birds			
Rock Dove*	*Columba livia*		O
Rainbow Lorikeet	*Trichoglossus haematodus*		O
Noisy Miner	*Manorina melanocephala*		O
Golden Whistler	*Pachycephala pectoralis*		O
Silvereye	*Zosterops lateralis*		O
Common Starling*	*Sturnus vulgaris*		W
Peregrine Falcon	*Falco peregrinus*		O

Common Name	Scientific Name	Conservation Status	Recorded AE
Mammals			

Common Name	Scientific Name	Conservation Status	Recorded AE
Reptiles			
Dark-flecked Garden Sunskink	*Lampropholis delicata*		O

Common Name	Scientific Name	Conservation Status	Recorded AE
Frogs			
Common Eastern Froglet	*Crinia signifera*		W

Key

* = Introduced fauna
O = Observed
W = Calls

6.3 Fauna Summary

The number of species from each faunal group, listed as 'likely to occur' can be seen in Appendix 4.

Mammals

No mammal species were detected on the site.

The site is highly disturbed and isolated so native fauna are likely to be highly mobile vagrants such as insectivorous bats.

Species not recorded during the survey but likely to occur on the site include domestic pets.

Reptiles

One reptile species was detected on the site.

There is little ground level habitat that will support a reptile population. Small skinks may occur in the M4 Motorway reserve and enter the site.

Species not recorded during the survey but likely to occur on the site include garden skinks.

Frogs

One frog species was detected on the site.

The site is mown lawn with a drainage swale that has no permanent breeding habitat. Species not recorded during the survey but likely to occur on the site include striped marsh frog that may migrate upstream through the drain under the M4.

Birds

Bird species detected on the site totalled seven (7).

The birds likely to occur are common urban species.

Species not recorded during the survey but likely to occur on the site include magpie and Indian Mynah.

6.4 Microbats

Foraging Habitat

This site provides potentially suitable foraging habitat for six of eight possible threatened species in the form of a dense tree canopy. *Myotis macropus* (syn. *Myotis adversus*) has no suitable foraging habitat in the form of open water bodies.

Roosting Habitat

No suitable roosting habitat occurs on the site.

6.5 Feral fauna

No evidence of feral fauna was detected on the site.

7. Discussion of results

The site has a history of disturbance in the form of understory clearing throughout the site. The site was most likely cleared in the 1970s when the housing development that is now known as St Clair was established. Excavation has occurred on the site to install a storm water pipe that runs from the west boundary to the northeast corner, and then toward Ropes Creek, as well as a sewer line across the site.

Remnant trees occur predominantly on the northern half of the site. Understory vegetation is lacking, however some native herb species continue to grow in this area. The site vegetation would have originally been what is now regarded as Shale Gravel transition Forest (SGTF) but is now not properly regarded as such. The species composition does not permit the vegetation to be described as the community. The Canopy trees *Eucalyptus fibrosa* and *Melaleuca decora* are indicators of SGTF but other native canopy species are present that are not part of that community. In a less disturbed condition it will have been some form of Cumberland Plain vegetation community. Even so the SGTF community is applied for the purpose of performing an assessment of significance (seven part test) under section 5A of the EP&A Act 1979.

Weed indicator species are present, indicating a high disturbance regime on the site. The site is in poor condition with weed infestation and exotic lawn present. The species diversity is dominated by weed species with one noxious species present.

No habitat trees occur on the site. Two large eucalypts may provide hollows as they continue to age, however they do not currently offer hollows or potential hollows. The canopy cover is dense on some parts of the site and supports a variety of insect species. Mistletoes occur on many of the site's Melaleuca trees. Common bird species such as the Noisy Miner use the site for foraging.

8. Impact on flora and fauna

8.1 Long-term prospects with no development or maintenance

Recruitment of new trees has continually been prevented from occurring due to the mown landscape beneath the trees. With time the remaining trees will age and begin to senesce without new trees to replace the canopy, which will ultimately result in a bare lawn dominated by exotics.

8.2 Possible long-term condition with maintenance and removal of threats

Removal of threats is likely to benefit existing native flora/fauna, however the surrounding area has been heavily impacted by anthropogenic influences, such as widespread clearing and housing development. Given the current use of the site and surrounding area, the site is unlikely to return to its original state.

8.3 Proposal and impact

8.3.1 Short-term impact

It is assumed that all vegetation north of the existing residential dwelling will be cleared. Thus approximately 1908m^2 of class 3 indigenous vegetation dominated by *Melaleuca decora* will be removed. The remaining area is approximately 2050m^2 or 52% of the local occurrence and is a Public Recreation reserve (Figure 6) so is secure tenure.

8.3.2 Long-term impact

Removal of flora and subsequent loss of foraging habitat for fauna is likely to be experienced in the long-term.

8.3.3 Stormwater, road runoff and effluent disposal

In addition to the existing residential property, thirteen (13) low-density residential properties will be established as a result of the proposal.

Construction of roads has the potential to impact terrestrial ecosystems between the site and the Western Motorway through changes to water quality, water quantity and water flow path.

Water quality can be directly related to road construction and maintenance activities, and vehicle movement and wear. Potential pollutants include gross pollutants and litter, sediment and suspended solids, toxic organics, nutrients, heavy metals and hydrocarbons.

Changes to water quantity (storm water runoff volumes) result from increased impervious surfaces, and lead to higher peak flow rates in Ropes Creek. This may increase the magnitude and frequency of in-stream habitat disturbances, causing the loss of species unsuited to such conditions. (Austroads 2001)

8.4 Impact on floral and faunal species, populations and communities

8.4.1 Seven-part test summary

Habitat requirements for locally occurring threatened faunal species, and the presence or absence of such habitat on the site, is tabulated in Appendix 5. Threatened plant species, listed in the TSC and EPBC Acts, are shown in Appendix 6.

Under Section 5A of the EP&A Act several factors (listed in Appendix 1) need to be considered in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their

habitats. If there is likely to be a significant effect on threatened species, etc., a Species Impact Statement is recommended.

Any mitigating considerations and offsets incorporated in the proposal are not taken into account in determining the outcome of the seven-part tests.

Table 8. Summary of the seven-part tests shown in full in Appendix 1

Species	Recorded on site	C'wealth listing EPBC Act '99	State listing TSC Act '95	Result
Insectivorous Bats	No			No significant effect
Eastern False Pipistrelle *Falsistrellus tasmaniensis*		-	Sch. 2, Vul.	
Eastern Freetail-bat *Mormopterus norfolkensis*		-	Sch. 2, Vul.	
Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*		-	Sch. 2, Vul.	
Greater Broad-nosed Bat *Scoteanax rueppellii*		-	Sch. 2, Vul.	
Little Bentwing-bat *Miniopterus australis*		-	Sch. 2, Vul.	
Southern Myotis *Myotis macropus*		Vulnerable	Sch. 2, Vul.	
Threatened Raptors	No			No significant effect
Little Eagle *Hieraaetus morphnoides*		-	Sch. 2, Vul.	
Square-tailed Kite *Lophoictinia isura*		-	Sch. 2, Vul.	
Grey-headed Flying-fox *Pteropus poliocephalus*	No	Vulnerable	Sch. 2, Vul.	No significant effect
Powerful Owl *Ninox strenua*	No	-	Sch 2, Vul.	No significant effect
Cumberland Plain Land Snail *Meridolum corneovirens*	No	-	Sch. 1, En.	No significant effect
Shale gravel transition forest in the Sydney Basin Bioregion	Yes	Critically Endangered	Sch. 1 En.	No significant effect

A Species Impact Statement is not recommended.

9. Planning Instruments

9.1 Environment Protection and Biodiversity Conservation Act 1999

The provisions of the EPBC Act apply to this proposal. Shale Gravel Transition Forest in the Sydney Basin Bioregion, which is a critically endangered ecological community, is present on this site.

An action has, will have, or is likely to have a significant impact on a critically endangered or endangered ecological community if it does, will, or is likely to have specific outcomes (Table 9).

Table 9: EPBC Act Impact assessment criteria

Criterion	Response
Lead to a long-term adverse effect on an ecological community, or	No. this is an isolated and degraded fragment. The area of the patch is less than 2ha so not triggering the EPBC threshold.
Reduce the extent of a community, or	Yes, a small area will be removed, reducing the local occurrence.
Fragment an occurrence of the community, or	No. The area is isolated by the M4 and urban development.
Adversely affect habitat critical to the survival of an ecological community, or	The habitat is already disturbed and unlikely to sustain the community in the long term.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the community's survival, or	Yes. The area will be residential development.
Result in invasive species that are harmful to the critically endangered or endangered community becoming established in an occurrence of the community*, or	No. The adjacent public recreation reserve is mown so weeds are not likely to invade.
Interfere with the recovery of an ecological community.	No. This site has no potential to contribute to recovery of this ecological community

The overall outcome will be to reduce the occurrence by 48% of a very small degraded fragment that has no prospect of recovery.

There will be no significant impact on the community resulting from the proposal, and does not require referral to the Commonwealth.

10. Recommendations

There is no impediment to the proposal in the scope of this report.

There are no trees of particular ecological value that need to be retained.

Recommendations

- All storm water that leaves the site is to be treated by a gross pollutant trap or better to meet water discharge standards.

11. References

Austroads (2001). *Road Runoff and Drainage: Environmental Impacts and Management Options* (AP-R180/01) Sydney: AARB Transport Research Ltd.

Barrett, G., Silcocks, A., Barry, S., Cunningham, R. and Poulter, R. (2003). *The New Atlas of Australian Birds*. Royal Australasian Ornithologists Union, Victoria.

Benson, D. & McDougall, L. (1991). *Rare Bushland Plants of Western Sydney*. Royal Botanical Gardens, Sydney.

Benson, D.H. and Howell, J. (1990). *Taken for granted: the bushland of Sydney and its suburbs*. Kangaroo Press, Kenthurst.

Berzins, K. (December 1999). *Interim Planning Guidelines for Cumberland Plain Woodland*. Hawkesbury-Nepean Catchment Management Trust.

Briggs, J. D., and Leigh, J. H. (1995). *Rare or Threatened Australian Plants*. CSIRO, Canberra.

Brooker, M. I. H. and Kleinig, D. A. (1990). *Field Guide to Eucalypts, Volume 1*. South-eastern Australia. Inkata, North Ryde.

Brunker, R. L. and Rose, G. (1967). *Sydney Basin 1:500,000 Geological Sheet*. Mercury Press Pty. Ltd. Hobart.

Carolin, R. C. and Tindale, M. D. (1994). *Flora of the Sydney Region Fourth Edition*. Reed, Chatswood.

Chapman, G.A., Murphy, C.L., Tille, P.J., Atkinson, G. and Morse, R.J. (1983). *Sydney Soil landscape series sheet 9130*. Soil Conservation Service of NSW, Sydney.

Cogger, H. G. (1983). *Reptiles and Amphibians of Australia*. Reed, Frenchs Forest.

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

Department of Environment, Climate Change and Water (NSW) (2010). *Cumberland Plain Recovery Plan*, OEH (NSW), Sydney.

Department of the Environment, Water, Heritage and the Arts (Australian Government) (2010). *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest – A guide to identifying and protecting the nationally threatened ecological community*. Policy Statement 3.31

Duffy et al. (2000). The efficacy of Anabat ultrasonic detectors and harp traps for surveying microchiropterans in south-eastern Australia. *Acta Chiropterologica*. 2(2): 127-144, 2000.

Ehmann, H. (1992). *Encyclopaedia of Australian Animals Reptiles*. Angus and Robertson, Pymble.

Ehmann, H. (Ed.) (1997). Overview Chapter, pages 13 - 42 In *Threatened Frogs of New South Wales: Habitats, Status and Conservation*. Frog and Tadpole Study Group of NSW Inc.

Fairley, A. and Moore, P. (1989). *Native Plants of the Sydney District, An Identification Guide*. Kangaroo Press, Kenthurst.

Hawkesbury Bushfire Management Committee (2000). Bush Fire Risk Management Plan. Prepared by the Hawkesbury Bush Fire Management Committee; pursuant to section 52 of the Rural Fires Act, 1997. Dated 23/2/00.

Hazelton, P. A., Bannerman, S. M. & Tillie, P.J. (1989). *Soil Landscapes of the Penrith 1:100 000 Sheet*. Soil Conservation Service of NSW, Sydney.

Leary, T. (2005). *Fauna Survey of Parks and Wildlife Division estate on the Cumberland Plain with some observations on the remnant mammal fauna*. Department of Environment and Conservation Oral presentation at the Symposium on Cumberland Plain Woodland. University of Western Sydney.

McDonald R. C., Isbell, R. F., Speight, J. G., Walker, J., & Hopkins, M. S., (1990). *Australian soil and land survey field handbook Second edition*. Inkata Press, Melbourne.

McKenzie, N. J., Grundy, M. J., Webster, R. and Ringrose, A. J. (2008). *Guidelines for Surveying Soil and Land Resources (Second Edition)*. CSIRO Publishing, Collingwood, VIC.

NSW NPWS (1997). *Native Flora of Western Sydney, Urban Bushland Biodiversity Survey*, National Parks & Wildlife Service, Hurstville, NSW.

NSW Scientific Committee, (2001). *Final Determination for Clearing of Native Vegetation*, Key Threatening Process.

NSW Scientific Committee, (2003). *Final Determination for Removal of Dead Wood and Dead Trees*, Key Threatening Process.

Richards, G. C., (2001). *Towards defining adequate bat survey methodology: why electronic call detection is essential throughout the night*. The Australian Bat Society Newsletter Number 16 March 2001: 24-28

Robinson, L. (1994). *Field Guide to the Native Plants of Sydney*. Kangaroo Press, Kenthurst.

Robinson, M. (1993). *A Field Guide to Frogs of Australia*. Reed/Australian Museum, Chatswood.

Simpson, K., Day, N. & Trusler, P. (1996). *Field Guide to the Birds of Australia*. Penguin, Ringwood, Vic.

Specht. R. L. (1970). *Vegetation of the Australian Environment*. G. W. Leeper (Ed.), 4th Edition, CSIRO, Melbourne.

Strahan, R. (Ed.) (1995). *The Mammals of Australia*. Reed, Sydney.

Tozer, M.G. Turner, K., Keith, D.A., Tindall, D., Pennay, C., Simpson, C., MacKenzie, B., Beukers, P. and Cox, S. (2010). Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. *Cunninghamia*, 11(3): 359-406.

Watson, D. M. (2011). A productivity-based explanation for woodland bird declines: poorer soils yield less food, EMU, 111: 10-18.

Appendix 1. Seven-part tests

Mitigating considerations and offsets are not taken into account in determining the outcome of the seven-part tests.

The Assessment of Significance (Office of Environment and Heritage (OEH)) states that "*Proposed measures that mitigate, improve or compensate for the action, development or activity should not be considered in determining the degree of the effect on threatened species, populations or ecological communities, unless the measure has been used successfully for that species in a similar situation.*"

Insectivorous bats

Eastern False Pipistrelle *Falsistrellus tasmaniensis*
Eastern Freetail-bat *Mormopterus norfolkensis*
Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*
Greater Broad-nosed Bat *Scoteanax rueppellii*
Little Bentwing-bat *Miniopterus australis*

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,

Eastern False Pipistrelle prefers moist habitats, with trees taller than 20 m. It generally roosts in Eucalypt hollows but has also been known to occupy space under loose bark and buildings. It forages for beetles, moths and other flying insects.

Eastern Freetail Bat roosts in tree hollows and forages above the canopy and in uncluttered habitats. It feeds on a variety of flying insects, such as moths, ants, cockroaches and grasshoppers, foraging mainly in forests on richer soils.

Eastern Bentwing-bat roosts in caves, old mines, stormwater channels and comparable structures including buildings. It forages in well-timbered valleys above the canopy.

Greater Broad-nosed Bat catches large beetles and other slow-flying insects. It inhabits a variety of habitats including woodlands through to rainforest, though not at altitudes above 500 m. The more open vegetation is preferred by this species due to its style of flight, but in denser habitats it overcomes difficulties by using natural and man-made openings in the forest.

Little Bentwing-bat forages for small insects beneath the canopy of densely vegetated habitats of moist eucalypt forest, rainforest or dense coastal Banksia scrub. Daytime roosts include caves, tunnels and sometimes tree hollows.

No. The risk of extinction will increase if any factor operates to reduce population size or reproduction success. Removal or modification of habitat or changes to the nature of important periodic disturbances (fire, flood) may affect survival of species. This is not a risk in this proposal.

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,

Not applicable. This test is for a group of threatened species.

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

Not applicable. This test is for a group of threatened species.

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

Not applicable. This test is for a group of threatened species.

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, and

The proposed activity requires the clearing of approximately 100 native canopy trees that predominantly occur on the north half of a 1ha property. Approximately 0.2 ha of poor quality potential foraging habitat will be removed.

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

No. This group of species is highly mobile. The clearing or modification of 1ha of poor quality foraging habitat is unlikely to isolate or fragment habitat for these species. The surrounding area is highly urbanised and lacks connectivity.

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,

Negligible. The locality is highly urbanised. Vegetation on the site consists of canopy trees and a lack of understory vegetation. Clearing of 1ha of poor quality foraging habitat is unlikely to have any significant effect on these species at local or regional scales.

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

No. Critical habitat has not been declared for these species.

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

No.

Recovery plans do not exist for these species. However, a number of priority actions have been identified for each of these species, as indicated in brackets after each name: Eastern False Pipistrelle (16), Eastern Freetail-bat

(18), Eastern Bentwing-bat (25), Greater Broad-nosed Bat (18) and Little Bentwing-bat (25).

The clearing of native vegetation is not consistent with the intent of any priority actions or objectives of recovery plans.

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.

Yes. The proposed development will require the "Clearing of native vegetation" which is a key threatening processes relevant to these species. Key threatening processes are listed under the TSC Act, 1995 and the Commonwealth's EPBC Act, 1999.

Conclusion

The proposed activity is unlikely to have a significant effect on Eastern False Pipistrelle, Eastern Freetail-bat, Eastern Bentwing-bat, Greater Broad-nosed Bat or Little Bentwing-bat.

Therefore a Species Impact Statement is not recommended.

Powerful Owl

Ninox strenua

Species profile

- The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest.

- The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, Rough-barked Apple *Angophora floribunda*, Cherry Ballart *Exocarpus cupressiformis* and a number of eucalypt species.

- The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. There may be marked regional differences in the prey taken by Powerful Owls. For example in southern NSW, Ringtail Possum make up the bulk of prey in the lowland or coastal habitat. At higher elevations, such as the tableland forests, the Greater Glider may constitute almost all of the prey for a pair of Powerful Owls. Flying foxes are important prey in some areas; birds comprise about 10-50% of the diet depending on the availability of preferred mammals. As most prey species require hollows and a shrub layer, these are important habitat components for the owl.

- Pairs of Powerful Owls demonstrate high fidelity to a large territory, the size of which varies with habitat quality and thus prey densities. In good habitats a mere 400 can support a pair; where hollow trees and prey have been depleted the owls need up to 4000 ha.

- Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. While the female and young are in the nest hollow the male Powerful Owl roosts nearby (10-200 m) guarding them, often choosing a

dense "grove" of trees that provide concealment from other birds that harass him.

Two vagrant records since 1990 include a sighting in 2012, 1.3km west at St Clair High School and in 2013 3km west. There would not appear to be a resident pair or population.

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,

No. The proposal is unlikely to have an adverse effect on Powerful Owl due to the high mobility of this species and the absence of suitable foraging habitat on site. It is unlikely that a viable local population will be placed at risk of extinction by the proposal.

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,

Not applicable. This test is for a threatened species.

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

Not applicable. This test is for a threatened species.

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

Not applicable. This test is for a threatened species.

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, and

Several large Eucalyptus species will be cleared which provide potential roosting habitat, however the majority of the 1ha site is highly exposed. The proposal area is predominantly mown lawn interspersed with stands of *Melaleuca* trees and several eucalypts.

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

No. This species is highly mobile and the size of the impact area is particularly small when compared with its foraging range. The site is isolated with only two records in St Clair in 25 years since 1990.

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,

Low to Negligible. The site is highly disturbed and exposed. While these species may forage on site, the habitat potential is not high, and the closest abundant natural habitat available is approximately 14km west of the site in the Nepean River corridor and Blue Mountains.

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

No. Critical habitat has not been declared for these species.

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

No. A recovery plan exists for Powerful Owl. The proposal is unlikely to modify potential roosting or breeding habitat for Powerful Owl, as no tree hollows are known to occur on site and roosting habitat quality is poor. However, the clearing of native is not consistent with the objectives of this recovery plan.

This species has been assigned to the Landscape species management stream under the *Saving our Species* program.
http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10562

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.

Yes. The proposed development will require the "Clearing of native vegetation" which is a key threatening processes relevant to this species. Key threatening processes are listed under the TSC Act, 1995 and the Commonwealth's EPBC Act, 1999.

Conclusion

The proposed activity is unlikely to have a significant effect on Powerful Owl.

Therefore a Species Impact Statement is not recommended.

Cumberland Plain Land Snail

Meridolum corneovirens

Species profile

- Primarily inhabits Cumberland Plain Woodland (a critically endangered ecological community). This community is a grassy, open woodland with occasional dense patches of shrubs. It is also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest, which are also listed communities.

- Lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish.

- Can dig several centimetres into soil to escape drought.

- Is a fungus specialist. Unlike the Garden Snail, does not eat green plants. It is generally active at night.

http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10526

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,

No. This species was not recorded on the site. The site is generally unsuitable for the snail as it is mown lawn, and lacks logs on the ground as feeding substrate nor build-up of leaf litter. No recordings of the snail during the site survey may be due to the disturbance history of the site. The proposal is highly unlikely to significantly affect the life cycle of the species or place any viable local population at risk of extinction.

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

Not applicable. This test is for a threatened species.

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

Not applicable. This test is for a threatened species.

(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

Not applicable. This test is for a threatened species.

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, and

The suitable habitat for this species occurs within Cumberland Plain Woodland. Vegetation on site is not Cumberland Plain Woodland, however the Cumberland Plain land snail has been reported as occurring near the site, and Cumberland Plain Woodland occurs within the locality. Several dead trees occur on the site, and dead wood and leaf litter occur beyond the north boundary of the site. 0.2ha of potential habitat will be removed for the proposal. No snails were recorded in the area to be cleared. Therefore, the proposed development is unlikely to negatively affect the local species population.

(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

No. The proposed work indicates the removal of approximately 0.2ha of marginal habitat. The site is mown and lacking understory vegetation, and lacks connectivity with suitable habitat.

(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,

Negligible. The vegetation to be removed for this proposal is unlikely to have an effect on the long-term survival of the species in the locality.

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

No. Critical habitat has not been declared for this species.

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

This species has been assigned to the Landscape species management stream under the *Saving our Species* program.
http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10526

No threat abatement plan or recovery plan exists for this species. A number (24) of priority actions have been identified for this species. However the proposal is unlikely to be consistent with the priority actions, as potential habitat will be removed.

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.

Yes. The proposed development will require the "Clearing of native vegetation", and "Removal of Dead Wood and Dead Trees" which are key threatening processes relevant to this species, the amount of potentially suitable habitat to be removed would be small and is unlikely to significantly impact this species. Key threatening processes are listed under the TSC Act, 1995 and the Commonwealth's EPBC Act, 1999.

Conclusion

The proposed activity is unlikely to have a significant effect on Cumberland Plain Land Snail. Therefore a Species Impact Statement is not recommended.

Grey-headed Flying fox

Pteropus poliocephalus

Species profile

- Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.

- Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.

- Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.

- Site fidelity to camps is high; some camps have been used for over a century.

- Can travel up to 50 km from the camp to forage; commuting distances are more often <20 km.

- Feed on the nectar and pollen of native trees, in particular *Eucalyptus, Melaleuca* and *Banksia*, and fruits of rainforest trees and vines.

- Also forage in cultivated gardens and fruit crops.

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,

No. The proposed works will require removal of some areas of indigenous vegetation including Eucalypts and melaleucas, which are foraging habitat for this species. No roosting camps were observed within or near to the survey area, with the nearest camps being at Penrith and Parramatta. The removal of Eucalypt and Melaleuca trees for the proposal are unlikely to have a significant effect on this species as similar habitat is widespread in the region and these species are highly mobile.

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,

Not applicable. This test is for a group of threatened species.

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

Not applicable. This test is for a group of threatened species.

(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

Not applicable. This test is for a group of threatened species.

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, and

The proposed works will remove stands of Melaleuca trees and several large Eucalypts, which are suitable foraging tree species.

(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

No. Grey-headed Flying-fox is a highly mobile species with home ranges in excess of 50 km. The proposed works require the removal of potential foraging habitat, which is not likely to fragment or isolate habitat for this species.

(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,

Low. As this species is highly mobile the removal of habitat is unlikely to adversely affect the ongoing survival of this species. Any individuals that forage on the site will have the same opportunities to forage in nearby habitats.

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

No. Critical habitat has not been declared for this species.

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

No. There is a draft national recovery plan (2009) for Grey-headed Flying-fox. Removal of habitat and disturbance of camps are threats for this species. No Grey-headed roosting sites (camps) were observed within the study area. The removal of foraging habitat is not consistent with the overall aims of the recovery plan.

This species has been assigned to the Landscape species management stream under the *Saving our Species* program.

http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10697

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.

Yes. The proposed development will require the "Clearing of native vegetation" which is a key threatening process relevant to this species. Key threatening processes are listed under the TSC Act, 1995 and the Commonwealth's EPBC Act, 1999.

Conclusion

The proposed activity is unlikely to have a significant effect on Grey-headed flying-fox. Therefore a Species Impact Statement is not recommended.

Raptors

Little Eagle *Hieraaetus morphnoides*

Species profile

- 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.

- Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.

Square-tailed Kite *Lophoictinia isura*

Species profile

- Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.

- In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland.
- Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage.

- Appears to occupy large hunting ranges of more than 100km^2.

- Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.

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,

No. These species are highly mobile and have very large home ranges. The preferred habitat of riparian forest and open woodland/ agricultural land is

available elsewhere within the district. Therefore it is highly unlikely to have an adverse effect such that a local population of any of these species will 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,

Not applicable. This test is for a group of threatened species.

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

Not applicable. This test is for a group of threatened species.

(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

Not applicable. This test is for a group of threatened species.

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, and

Approximately 0.2ha ha of marginal foraging habitat will be removed for 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

No. These species are highly mobile, the proposal is unlikely to cause significant fragmentation or isolation of habitat.

(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,

Negligible. Higher quality habitat is available approximately 800m east of the site. It is highly unlikely that the long-term survival of locally occurring populations will be adversely affected by the proposed works.

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

No. Critical habitat has not been declared for these species.

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

No. There are no recovery plans available for these species, however three priority actions have been identified for Square-tailed Kite. The threats common to these species include the disturbance of foraging habitat, nesting sites and the clearing of habitat. The clearing of native vegetation is not consistent with the intent of any priority actions or objectives of recovery plans. While the proposed works will clear or modify 0.2ha of marginal foraging habitat, the effect is not considered significant.

Little Eagle and Square-tailed Kite have been assigned to the Landscape species management stream under the *Saving our Species* program http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10495

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.

Yes. The proposed development will require the "Clearing of native vegetation" which is a key threatening processes relevant to these species. Key threatening processes are listed under the TSC Act, 1995 and the Commonwealth's EPBC Act 1999.

Conclusion

The proposed activity is unlikely to have a significant effect on Little Eagle or Square-tailed Kite.

Therefore a Species Impact Statement is not recommended.

Shale Gravel Transition Forest in the Sydney Basin Bioregion

Profile

Shale Gravel Transition Forest in the Sydney Basin Bioregion has an open forest structure with a canopy dominated by Broad-leaved Ironbark *Eucalyptus fibrosa*, with Grey Box *E. moluccana* and Forest Red Gum *E. tereticornis* occurring less frequently. Paperbark *Melaleuca decora* is common in the small tree layer. A sparse shrub layer is usually present which includes Blackthorn *Bursaria spinosa*, *Daviesia ulicifolia* and Peach Heath *Lissanthe strigosa*.

- Occurs primarily where shallow deposits from ancient river systems overlay shale soils, but also associated with localised concentrations of iron-hardened gravel.

- A transitional plant community which grades into Cumberland Plain Woodland where the influence of gravel soil declines, and grades into Cooks River/Castlereagh Ironbark Forest or Castlereagh Scribbly Gum Woodland where gravel deposits are thick.

- The shrub understorey includes a number of listed threatened species in the 'pea' flower group. The plants in this group rely on nitrogen fixing root nodules and soil/root fungi to extract nutrients form the poor soils.

- There are periodic fires in Shale-Gravel Transition Forest and most species are able to regenerate from lignotubers and buds beneath the bark, as well as seed stored in the soil.

http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10754

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,

Not applicable. This test is for an endangered ecological community.

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,

Not applicable. This test is for an endangered ecological community.

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

There is approximately 1908m^2 of Shale Gravel Transition Forest in the Sydney Basin Bioregion within the site and a further 2050m^2 on an adjacent public recreation reserve. The proposal is unlikely to have an adverse effect on the life cycle of Shale Gravel Transition Forest in the Sydney Basin Bioregion, such that it will become extinct in the locality.

(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

No.
The community on the adjacent land has less disturbance history than the subject land, with no sewer or drainage pipe lines excavated.

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, and

Approximately 1908m^2 of habitat of Shale Gravel Transition Forest in the Sydney Basin Bioregion will be removed for 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

No. Shale Gravel Transition Forest (SGTF) in the Sydney Basin Bioregion that exists on and adjacent to the site lacks connectivity with vegetation in the

locality due to urban development. The proposal will remove remnant trees from this CEEC. This will not increase isolation from remaining patches, as it is an already isolated patch. The trees on the adjacent land are similar to those on site in age and density.

(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,

Low.

Criterion	Comment
Area and quality of habitat within the locality	The nearest occurrences are mapped at Ropes Creek 4km north and 8km south at Kemps Creek as large patches.
Area and quality of habitat on site in relation to the area and quality of habitat in the locality	This patch at <0.2ha is very small and does not meet the threshold criteria to be regarded as an intact or recognisable occurrence.
Role of habitat to be affected in sustaining habitat connectivity in the locality	Nil. A planted landscape along the M4 provides the only recognisable vegetation connectivity.
The ecological integrity of habitat to be affected on site, in relation to the ecological integrity, tenure and security of the habitat which will remain both on site and in locality.	The site has minimal ecological integrity or function, similar to that on the adjacent land. There is no other occurrence in the urban area of St Clair but the community does occur along Ropes Creek.

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

No. Critical habitat has not been declared for this critically endangered ecological community.

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

No.

The removal of an area of Shale Gravel Transition Forest in the Sydney Basin Bioregion, even a degraded area is unlikely to be consistent with the overall aims of the recovery plan. However the area and condition of the site are such that the loss will not be of importance.

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.

Yes. The proposed development will require the "Clearing of native vegetation" which is a key threatening process relevant to this ecological community. However the area and condition of the site are such that the loss will not be of importance. Key threatening processes are listed under the TSC Act, 1995 and the Commonwealth's EPBC Act, 1999.

Conclusion

The proposed activity is unlikely to have a significant effect on Shale Gravel Transition Forest in the Sydney Basin Bioregion.

Therefore a Species Impact Statement is not recommended.

Appendix 2. Final Determinations

The Scientific Committee, established by the Threatened Species Conservation Act 1995, has made a Final Determination to list the following processes, which are applicable to the proposal, as key threatening processes on Schedule 3 of the Act:

a) Clearing of Native Vegetation

A full profile of all listed key threatening processes can be a seen at the NSW NPWS website:
http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_threats.aspx

Appendix 3. Flora species list

The grid reference for this locality is 296435.427East, 6258788.283 North (GDA 1994)

Acacia parvipinnula
 # Acacia podalyriifolia
** Alternanthera pungens*
Amyema gaudichaudii
** Asparagus aethiopicus*
** Asparagus asparagoides* N4
** Aster subulatus*
** Bidens pilosa*
** Bidens subalternans*
Bursaria spinosa
Centella asiatica
** Chamaecyparis pisifera*
** Chloris gayana*
Commelina cyanea
** Conyza bonariensis*
Cynodon dactylon
** Cyperus eragrostis*
Cyperus gracilis
Desmodium varians
Dianella caerulea
Dichondra repens
** Digitaria sanguinalis*
Einadia nutans
Einadia trigonos
** Eragrostis curvula*
** Ehrharta erecta*
Eucalyptus fibrosa
Eucalyptus globoidea
Eucalyptus longifolia
** Euphorbia peplus*
** Gamochaeta americana*
** Pelargonium domesticum*
Glycine clandestina
Glycine tabacina
** Ligustrum sinense*
** Lotus sp.*
Melaleuca decora
Microlaena stipoides
** Murraya paniculata*
** Olea europaea subsp. cuspidata*
** Oxalis sp.* (yellow flower group)
** Panicum maximum*
** Paronychia brasiliana*
Paspalidium distans
** Paspalum dilatatum*
** Paspalum urvillei*
** Pennisetum clandestinum*
** Pinus contorta*
** Plantago lanceolata*
Poranthera microphylla
Portulaca oleracea
** Prunus sp. (Nectarine?)*
** Richardia brasiliensis*
** Rumex crispus*
** Sida Rhombifolia*
** Solanum nigrum*
** Soliva sp.*
** Stellaria media*
** Taraxacum officinale*
Tetragonia tetragonioides
** Trifolium repens*
** Verbena bonariensis*
Veronica plebeia
** Vicia sativa*

Key
* = Exotic species
# = Native but not indigenous to the Sydney Basin
N = Noxious species
Indicator species for Shale Gravel Transition Forest

Appendix 4. Expected fauna species in the Sydney Basin

Mammals

Common name	Scientific name
White-striped Freetail-bat	*Tadarida australis*
Gould's Wattled Bat	*Chalinolobus gouldii*
Chocolate Wattled Bat	*Chalinolobus morio*
Lesser Long-eared Bat	*Nyctophilus geoffroyi*
Gould's Long-eared Bat	*Nyctophilus gouldi*
Bush Rat	*Rattus fuscipes*
Swamp Rat	*Rattus lutreolus*
Long-nosed Bandicoot	*Perameles nasuta*
Brown Antechinus	*Antechinus stuartii*
Dusky Antechinus	*Antechinus swainsonii*
Yellow-footed Antechinus	*Antechinus flavipes*
Common Wombat	*Vombatus ursinus*
Common Ringtail Possum	*Pseudocheirus peregrinus*
Sugar Glider	*Petaurus breviceps*
Feathertail Glider	*Acrobates pygmaeus*
Eastern Grey Kangaroo	*Macropus giganteus*
Large Forest Bat	*Vespadelus darlingtoni*
Little Forest Bat	*Vespadelus vulturnus*
Common Wallaroo	*Macropus robustus*
Red-necked Wallaby	*Macropus rufogriseus*
Swamp Wallaby	*Wallabia bicolor*
Common Brushtail Possum	*Trichosurus vulpecula*
Greater Glider	*Petauroides volans*
Short-beaked Echidna	*Tachyglossus aculeatus*
Fox	*Vulpes vulpes*
Black Rat	*Rattus rattus*
Rabbit	*Oryctolagus cuniculus*

Frogs

Common Name	Scientific Name
Green Tree Frog	*Litoria caerulea*
Blue Mountains Tree Frog	*Litoria citropa*
Bleating Tree Frog	*Litoria dentata*
Eastern Dwarf Tree Frog	*Litoria fallax*
Jervis Bay Tree Frog	*Litoria jervisiensis*
Broad-palmed Frog	*Litoria latopalmata*
Peron's Tree Frog	*Litoria peronii*
Leaf-green Tree Frog	*Litoria phyllochroa*
Tyler's Tree Frog	*Litoria tyleri*
Verreaux's Frog	*Litoria verreauxii*
Common Eastern Froglet	*Crinia signifera*
Eastern Banjo Frog	*Limnodynastes dumerilii*
Ornate Burrowing Frog	*Limnodynastes ornatus*
Brown-striped Frog	*Limnodynastes peronii*

Common Name	Scientific Name
Spotted Grass Frog	*Limnodynastes tasmaniensis*
Haswell's Froglet	*Paracrinia haswelli*
Smooth Toadlet	*Uperoleia laevigata*
Tyler's Toadlet	*Uperoleia tyleri*

Reptiles

Common Name	Scientific Name
Diamond Python	*Morelia spilota spilota*
Common Death Adder	*Acanthophis antarcticus*
Yellow-faced Whip Snake	*Demansia psammophis*
Common Tree Snake	*Dendrelaphis punctulatus*
Golden-crowned Snake	*Cacophis squamulosus*
Eastern Small-eyed Snake	*Cryptophis nigrescens*
Red-naped Snake	*Furina diadema*
Black-bellied Swamp Snake	*Hemiaspis signata*
Tiger Snake	*Notechis scutatus*
Red-bellied Black Snake	*Pseudechis porphyriacus*
Eastern Brown Snake	*Pseudonaja textilis*
Dwyer's Snake	*Parasuta dwyeri*
Bandy Bandy	*Vermicella annulata*
Blackish Blind Snake	*Ramphotyphlops nigrescens*
Wood Gecko	*Diplodactylus vittatus*
Lesueur's Velvet Gecko	*Oedura lesueurii*
Broad-tailed Gecko	*Phyllurus platurus*
Thick-tailed Gecko	*Underwoodisaurus milii*
Burton's Snake-lizard	*Lialis burtonis*
Common Scaly-foot	*Pygopus lepidopodus*
Jacky Lizard	*Amphibolurus muricatus*
Bearded Dragon	*Pogona barbata*
Punctate Worm-skink	*Anomalopus swansoni*
Eastern Blue-tongue	*Tiliqua scincoides*
Southern Rainbow-skink	*Carlia tetradactyla*
Cream-striped Shinning-skink	*Cryptoblepharus virgatus*
Robust Ctenotus	*Ctenotus robustus*
Copper-tailed Skink	*Ctenotus taeniolatus*
Mainland She-oak Skink	*Cyclodomorphus michaeli*
Pink-tongued Skink	*Cyclodomorphus gerrardii*
Cunningham's Skink	*Egernia cunninghami*
Black Rock Skink	*Egernia saxatilis*
White's Skink	*Liopholis whitii*
Eastern Water-skink	*Eulamprus quoyii*
Barred-sided Skink	*Eulamprus tenuis*
Dark-flecked Garden Sunskink	*Lampropholis delicata*
Pale-flecked Garden Sunskink	*Lampropholis guichenoti*
Weasel Skink	*Saproscincus mustelinus*
Red-throated Skink	*Acritoscincus platynota*
Three-toed Skink	*Saiphos equalis*
Lace Monitor	*Varanus varius*
Eastern Snake-necked Turtle	*Chelodina longicollis*

Birds

Common Name	Scientific Name
Brown Quail	*Coturnix ypsilophora*
Black Swan	*Cygnus atratus*
Australian Wood Duck	*Chenonetta jubata*
Mallard	*Anas platyrhynchos*
Pacific Black Duck	*Anas superciliosa*
Grey Teal	*Anas gracilis*
Chestnut Teal	*Anas castanea*
Australasian Grebe	*Tachybaptus novaehollandiae*
Great Crested Grebe	*Podiceps cristatus*
Hoary-headed Grebe	*Poliocephalus poliocephalus*
Little Pied Cormorant	*Microcarbo melanoleucos*
Little Black Cormorant	*Phalacrocorax sulcirostris*
Great Cormorant	*Phalacrocorax carbo*
Australian Pelican	*Pelecanus conspicillatus*
White-faced Heron	*Egretta novaehollandiae*
Little Egret	*Egretta garzetta*
White-necked Heron	*Ardea pacifica*
Great Egret	*Ardea alba*
Cattle Egret	*Ardea ibis*
Intermediate Egret	*Ardea intermedia*
Australian White Ibis	*Threskiornis molucca*
Straw-necked Ibis	*Threskiornis spinicollis*
Royal Spoonbill	*Platalea regia*
Black-shouldered Kite	*Elanus axillaris*
Whistling Kite	*Haliastur sphenurus*
Wedge-tailed Eagle	*Aquila audax*
White-bellied Sea-eagle	*Haliaeetus leucogaster*
Swamp Harrier	*Circus approximans*
Brown Goshawk	*Accipiter fasciatus*
Collared Sparrowhawk	*Accipiter cirrocephalus*
Brown Falcon	*Falco berigora*
Australian Hobby	*Falco longipennis*
Nankeen Kestrel	*Falco cenchroides*
Buff-banded Rail	*Gallirallus philippensis*
Purple Swamphen	*Porphyrio porphyrio*
Dusky Moorhen	*Gallinula tenebrosa*
Eurasian Coot	*Fulica atra*
Latham's Snipe	*Gallinago hardwickii*
Black-winged Stilt	*Himantopus himantopus*
Black-fronted Dotterel	*Elseyornis melanops*
Masked Lapwing	*Vanellus miles*
Silver Gull	*Chroicocephalus novaehollandiae*
Rock Dove	*Columba livia*
White-headed Pigeon	*Columba leucomela*
Spotted Turtle-dove	*Streptopelia chinensis*
Brown Cuckoo-dove	*Macropygia amboinensis*
Emerald Dove	*Chalcophaps indica*

Common Name	Scientific Name
Common Bronzewing	*Phaps chalcoptera*
Crested Pigeon	*Ocyphaps lophotes*
Bar-shouldered Dove	*Geopelia humeralis*
Wonga Pigeon	*Leucosarcia picata*
Topknot Pigeon	*Lopholaimus antarcticus*
Yellow-tailed Black-cockatoo	*Calyptorhynchus funereus*
Galah	*Eolophus roseicapilla*
Little Corella	*Cacatua sanguinea*
Sulphur-crested Cockatoo	*Cacatua galerita*
Rainbow Lorikeet	*Trichoglossus haematodus*
Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*
Australian King-parrot	*Alisterus scapularis*
Crimson Rosella	*Platycercus elegans*
Eastern Rosella	*Platycercus eximius*
Fan-tailed Cuckoo	*Cacomantis flabelliformis*
Horsfield's Bronze-cuckoo	*Chalcites basalis*
Channel-billed Cuckoo	*Scythrops novaehollandiae*
Asian Koel	*Eudynamys scolopaceus*
Southern Boobook	*Ninox novaeseelandiae*
Barn Owl	*Tyto alba*
Tawny Frogmouth	*Podargus strigoides*
White-throated Nightjar	*Eurostopodus mystacalis*
Australian Owlet-nightjar	*Aegotheles cristatus*
White-throated Needletail	*Hirundapus caudacutus*
Laughing Kookaburra	*Dacelo novaeguineae*
Sacred Kingfisher	*Todiramphus sanctus*
Rainbow Bee-eater	*Merops ornatus*
Dollarbird	*Eurystomus orientalis*
Superb Lyrebird	*Menura novaehollandiae*
Satin Bowerbird	*Ptilonorhynchus violaceus*
Superb Fairy-wren	*Malurus cyaneus*
Variegated Fairy-wren	*Malurus lamberti*
Spotted Pardalote	*Pardalotus punctatus*
White-browed Scrubwren	*Sericornis frontalis*
Large-billed Scrubwren	*Sericornis magnirostra*
Brown Gerygone	*Gerygone mouki*
White-throated Gerygone	*Gerygone albogularis*
White-throated Treecreeper	*Cormobates leucophaea*
Brown Thornbill	*Acanthiza pusilla*
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*
Yellow Thornbill	*Acanthiza nana*
Striated Thornbill	*Acanthiza lineata*
Red Wattlebird	*Anthochaera carunculata*
Little Wattlebird	*Anthochaera chrysoptera*
Noisy Friarbird	*Philemon corniculatus*
Bell Miner	*Manorina melanophrys*
Noisy Miner	*Manorina melanocephala*
Lewin's Honeyeater	*Meliphaga lewinii*
Yellow-faced Honeyeater	*Lichenostomus chrysops*
White-plumed Honeyeater	*Lichenostomus penicillatus*
Brown-headed Honeyeater	*Melithreptus brevirostris*
White-naped Honeyeater	*Melithreptus lunatus*

Common Name	Scientific Name
New Holland Honeyeater	*Phylidonyris novaehollandiae*
Eastern Spinebill	*Acanthorhynchus tenuirostris*
Scarlet Honeyeater	*Myzomela sanguinolenta*
Jacky Winter	*Microeca fascinans*
Rose Robin	*Petroica rosea*
Eastern Yellow Robin	*Eopsaltria australis*
Eastern Whipbird	*Psophodes olivaceus*
Crested Shrike-tit	*Falcunculus frontatus*
Golden Whistler	*Pachycephala pectoralis*
Rufous Whistler	*Pachycephala rufiventris*
Grey Shrike-thrush	*Colluricincla harmonica*
Black-faced Monarch	*Monarcha melanopsis*
Leaden Flycatcher	*Myiagra rubecula*
Restless Flycatcher	*Myiagra inquieta*
Magpie-lark	*Grallina cyanoleuca*
Rufous Fantail	*Rhipidura rufifrons*
New Zealand Fantail	*Rhipidura fuliginosa*
Willie Wagtail	*Rhipidura leucophrys*
Spangled Drongo	*Dicrurus bracteatus*
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*
White-bellied Cuckoo-shrike	*Coracina papuensis*
Olive-backed Oriole	*Oriolus sagittatus*
Dusky Woodswallow	*Artamus cyanopterus*
Grey Butcherbird	*Cracticus torquatus*
Australian Magpie	*Cracticus tibicen*
Pied Currawong	*Strepera graculina*
Australian Raven	*Corvus coronoides*
White-winged Chough	*Corcorax melanorhamphos*
Apostlebird	*Struthidea cinerea*
Eurasian Skylark	*Alauda arvensis*
Australasian Pipit	*Anthus novaeseelandiae rogersi*
House Sparrow	*Passer domesticus*
Red-browed Finch	*Neochmia temporalis*
Double-barred Finch	*Taeniopygia bichenovii*
Mistletoebird	*Dicaeum hirundinaceum*
Welcome Swallow	*Hirundo neoxena*
Tree Martin	*Petrochelidon nigricans*
Fairy Martin	*Petrochelidon ariel*
Cicadabird	*Coracina tenuirostris*
Red-whiskered Bulbul	*Pycnonotus jocosus*
Australian Reed-warbler	*Acrocephalus australis*
Little Grassbird	*Megalurus gramineus*
Golden-headed Cisticola	*Cisticola exilis*
Silvereye	*Zosterops lateralis*
Eurasian Blackbird	*Turdus merula*
Common Starling	*Sturnus vulgaris*
Common Myna	*Sturnus tristis*

Appendix 5. Habitat requirements for locally-occurring threatened fauna species

Invertebrates

Common Name ***Scientific Name*** Schedule Listing	**Preferred Habitat**	**Comments**
Cumberland Plain Land Snail *Meridolum corneovirens* TSC Act, Sch. 1, End. EPBC Act, Vul.	Found amongst logs and debris in Cumberland Plain and Castlereagh woodlands.	No suitable natural habitat occurs on the site. Poor connectivity. Probable aviary escapee. Old record

Mammals

Common Name ***Scientific Name*** Schedule Listing	**Preferred Habitat**	**Comments**
Eastern False Pipistrelle *Falsistrellus tasmaniensis* TSC Act, Sch. 2, Vul.	Little known of habitat. Has been found roosting in stem holes of living Eucalypts	No suitable natural habitat occurs on the site. Poor connectivity. Probable aviary escapee. Old record
Eastern Freetail-bat *Mormopterus norfolkensis* TSC Act, Sch. 2, Vul.	Dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roosts mainly in tree hollows but will also roost under bark or in man-made structures.	No suitable natural habitat occurs on the site. Poor connectivity. Probable aviary escapee. Old record
Eastern Bentwing-bat *Miniopterus schreibersii oceanensis* TSC Act, Sch. 2, Vul.	Well-timbered valleys. Roosts in caves and storm-water channels and similar structures. Does not roost in tree hollows.	No suitable natural habitat occurs on the site. Poor connectivity. Probable aviary escapee. Old record
Little Bentwing-bat *Miniopterus australis* TSC Act, Sch. 2, Vul.	Well-timbered habitats incl. rainforest, Melaleuca swamps and dry sclerophyll forests. Roosts in caves and storm-water channels and similar structures. Does not roost in tree hollows.	No suitable natural habitat occurs on the site. Poor connectivity. Probable aviary escapee. Old record
Southern Myotis	Requires open areas of water over	No suitable natural

Common Name *Scientific Name* Schedule Listing	Preferred Habitat	Comments
Myotis macropus TSC Act, Sch. 2, Vul.	which it hunts. Roosts in caves, under bridges and buildings and sometimes in dense foliage in rainforests. May roost in tree hollows.	habitat occurs on the site. Poor connectivity. Probable aviary escapee. Old record
Greater Broad-nosed Bat *Scoteanax rueppellii* TSC Act, Sch. 2, Vul. EPBC Act, Lower risk (near threatened)	Found in woodlands, moist and dry sclerophyll forests and rainforests. Prefers gullies. Roosts in tree hollows only.	No suitable natural habitat occurs on the site. Poor connectivity. Probable aviary escapee. Old record
Grey-headed Flying-fox *Pteropus poliocephalus* TSC Act, Sch. 2, Vul. EPBC Act, Vul.	Found in rainforest, wet and dry sclerophyll forest and mangroves. Camps are usually in gullies, close to water and in vegetation with a dense canopy. Feeds on a wide variety of flowering and fruiting plants.	No suitable natural habitat occurs on the site. Poor connectivity. Probable aviary escapee. Old record

Frogs

Common Name *Scientific name* Schedule Listing	Preferred Habitat	Comments
Green and Golden Bell Frog *Litoria aurea* TSC Act, Sch. 1, End. EPBC Act, Vul.	Permanent water sources with vegetated margins in dams, lagoons, streams, swamps or ornamental ponds.	No suitable natural habitat occurs on the site. Poor connectivity. Probable aviary escapee. Old record

Birds

Common Name *Scientific Name* Schedule Listing	Preferred Habitat	Comments
Regent Honeyeater *Xanthomyza phrygia* TSC Act, Sch. 1, Endangered.	Occurs in temperate Eucalypt woodlands and open forests. Has a particular liking for Box and Ironbark Eucalypts as well as Swamp Mahogany and Spotted Gum.	No suitable natural habitat occurs on the site. Poor connectivity. Probable aviary escapee. Old record
Varied Sittella *Daphoenositta chrysoptera*	Inhabits eucalypt forests and woodlands, especially those	No suitable natural habitat occurs on the

Common Name *Scientific Name* Schedule Listing	Preferred Habitat	Comments
TSC Act Sch. 2, Vul.	containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland	site. Poor connectivity. Probable aviary escapee. Old record
Powerful Owl *Ninox strenua* TSC Act, Sch. 2, Vul.	Pairs occupy permanent territories in mountain forests, gullies and forest margins, sparser hilly woodlands, coastal forests, woodlands and scrubs.	No suitable natural habitat occurs on the site. Poor connectivity. Probable aviary escapee. Old record

Appendix 6. Habitat requirements for locally-occurring threatened plant species

Botanical name conservation status	Habitat description	Suitable habitat on site
Acacia pubescens ROTAP, 3VCa TSC Act, Sch. 2, Vul. EPBC Act, Vul.	Usually grows in dry sclerophyll forest and woodland in clay soils. Often in roadside and railside bushland remnants.	No
Dillwynia tenuifolia ROTAP, 2RCa TSC Act, Sch. 2, Vul.	Grows in dry sclerophyll woodland on sandstone, shale or laterite; from Cumberland Plain, Blue Mtns to Howes Valley area.	No
Grevillea juniperina subsp. *juniperina* TSC Act, Sch. 2, Vul.	Grows in open dry sclerophyll (eucalypt-dominated) forest or woodland, at altitudes of less than about 50 m, in sandy to clay-loam soils and red pseudolateritic gravels.	No
Grevillea parviflora subsp. *parviflora* TSC Act, Sch. 2, Vul. EPBC Act, Vul.	Grows in heathy associations or shrubby woodland, in sandy or light clay soils usually over shale substrates.	No
Marsdenia viridiflora subsp. *viridiflora* TSC Act, Sch. 1, End. Pop.	Grows in woodland and scrub; north from the Razorback Ra. (Bankstn, Blacktn, Camden, Campbelltn, Fairfield, Holroyd, Liverpool & Penrith LGAs)	No
Micromyrtus minutiflora ROTAP, 2V TSC Act, Sch. 1, End. EPBC Act, Vul.	Grows in dry sclerophyll forest in western part of the Cumberland Plain; rare.	No
Persoonia nutans ROTAP, 2ECi TSC Act, Sch. 1, End. EPBC Act, End.	Grows in woodland to dry sclerophyll forest on laterite and alluvial sand; confined to the Cumberland Plain.	No
Pimelea spicata ROTAP, 3ECi TSC Act, Sch. 1, End. EPBC Act, End.	Grows on the coast from Lansdowne to Shellharbour and inland to Penrith; rare.	No
Pultenaea parviflora ROTAP, 2E TSC Act, Sch. 1, End. EPBC Act, Vul.	Grows in dry sclerophyll forest on Wianamatta Shale, laterite or alluvium, Cumberland Plain.	No

Species of national/state significance with unsubstantiated records in western Sydney

Acacia mathewii (Cattai NP)

Atkinsonia ligustrina (Grose Vale)

Boronia serrulata (Baulkham Hills)

Deyeuxia appressa (Duck River, Auburn)

Haloragis exalata var. exalata (Maroota, Baulkham Hills)

Syzygium paniculatum (Cornelia, Baulkham Hills)

Key

TSC Act 1995:
- Sch1 = Schedule 1: Endangered species
  - Part 1: endangered species
  - Part 2: endangered populations
  - Part 3: endangered ecological communities
  - Part 4: species presumed extinct
- Sch2 = Schedule 2: Vulnerable species

EPBC Act 1999:
- CE = Critically Endangered
- E = Endangered
- V = Vulnerable
- EP = Endangered Population

W-Syd End = Western Sydney endemic species
X – WSyd = Extinct in western Sydney

ROTAP Codes
- 1 Known by one collection only
- 2 Geographic range in Australia < 100Km
- 3 " " " > 100Km
- E Endangered
- V Vulnerable
- R Rare
- X Extinct
- K Poorly known
- C Reserved
- a > or = 1000 plants reserved
- i < 1000 plants reserved
- t Total known population reserved
- - Reserved population size unknown
- + Overseas occurrence

Appendix 7. Company Profile

Abel Ecology has been in the flora and fauna consulting business since 1991, starting in the Sydney Region, and progressively more state wide in New South Wales since 1998, and now also in Victoria. During this time extensive expertise has been gained with regard to Master Planning, Environmental Impact assessments including flora and fauna, bushfire reports, Vegetation Management Plans, Management of threatened species, Review of Environmental Factors, Species Impact Statements and as Expert Witness in the Land and Environment Court. We have done consultancy work for industrial and commercial developments, golf courses, civil engineering projects, tourist developments as well as residential and rural projects. This process has also generated many connections with relevant government departments and city councils in NSW. Our team consists of four scientists and two administrative staff, plus casual assistants as required.

Licences

NPWS s132C Scientific licence number is SL100780 expires 30 April 2015
NPWS GIS data licence number is CON95034
DG NSW Dept of Primary Industries Animal Care and Ethics Committee Approval expires 8 December 2015
DG NSW Dept of Primary Industries Animal Research Authority expires 8 December 2014

The Consultancy Team

Dr Danny Wotherspoon

Grad Dip Bushfire Protection (University of Western Sydney 2012)
PhD, researching Cumberland Plain vegetation and fauna habitat, at Centre for Integrated Catchment Management (University of Western Sydney, 2007)
Planning for Bushfire Protection Certificate course (University of Technology, 2006)
Consulting Planners Bushfire Training Course (Planning Institute of Australia, 2003)
MA (Macquarie University, 1991)
Wildlife Photography Certificate (Sydney Technical College, 1987)
Herpetological Techniques Certificate (Sydney Technical College, 1986)

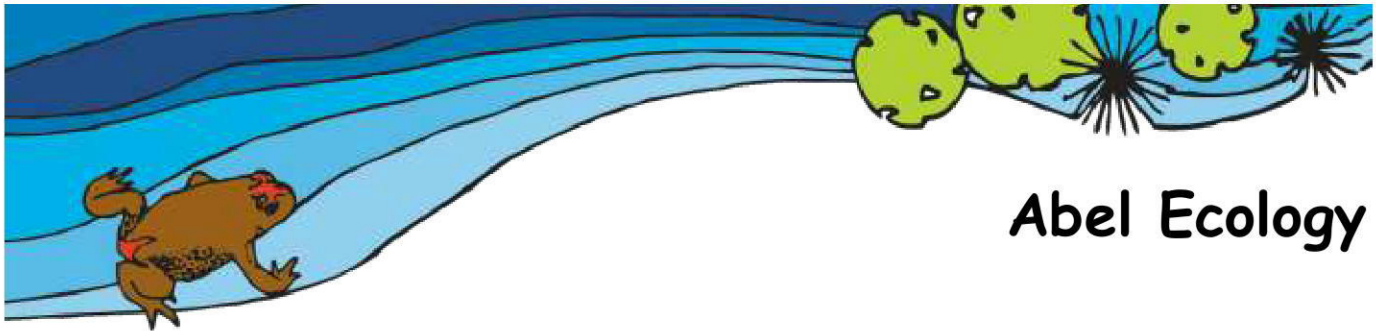
Applied Herpetology Certificate (Sydney Technical College, 1980)
Dip Ed (University of New England, 1978)
BSc (University of New England - Triple Majors in Zoology, incl. Ecological Zoology, 1974)

Dr Daniel McDonald

PhD (The University of Sydney 2006)
M. Agr (The University of Sydney 1996)
B. Ag Sc. (The University of Sydney 1991)

Jesse Tree

Bachelor of Natural Sciences and Horticulture (University of Western Sydney, (2013,
Cert 111 in Information Technology (Western Sydney TAFE, 2009).



Abel Ecology

Bushfire assessment report

for

94-100 Explorers Way, St Clair
Lot 36, DP 239502

Proposed residential subdivision

Date: 2 June 2015.
Document No: 1416-REP-68-ISS-1
Prepared for: Silky Constructions
Prepared by: Abel Ecology

PO Box 495
Unit 2, 10-11 Ferguson Road
Springwood NSW 2777

T (02) 4751 9487
F (02) 4751 9488
E info@abelecology.com.au
www.abelecology.com.au

Abel Ecology Pty Ltd
2 Samuel 20:18 ACN 079 079 762 – ABN 72 516 253 751

Disclaimer

This report has been prepared in accordance with the scope of services described in agreement between Abel Ecology and the Client.

In preparing this report, Abel Ecology has relied upon data, surveys and site inspection results taken at or under the particular time and or conditions specified herein. Abel Ecology has also relied on certain verbal information and documentation provided by the Client and/or third parties, but did not attempt to independently verify the accuracy or completeness of that information. To the extent that the conclusions and recommendations in this report are based in whole or in part on such information, they are contingent on its validity. Abel Ecology assumes no responsibility for any consequences arising from any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to Abel Ecology.

The findings contained in this report are the result of discrete/specific methodologies used in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site in question. Under no circumstances, however, can it be considered that these findings represent the actual state of the site/sites at all points.

Any representation, statement, opinion or advice, expressed or implied in this publication is made in good faith but on the basis that Abel Ecology, its agents and employees are not liable (whether by reason of negligence, lack of care or otherwise) to any person for any damage or loss whatsoever, which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in respect of any representation, statement, or advice referred to above. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client.

Furthermore, this report has been prepared solely for use by the Client. Abel Ecology accepts no responsibility for its use by other parties.

Document history

Report	Version	Prepared by	Checked by	Submission	
				Method	Date
Draft report	Draft A	Dr Danny Wotherspoon	Venetia Keane	Email	8May15
Final report	Issue 1	Dr Danny Wotherspoon	Venetia Keane	Email	2Jun15

Table of Contents

Table of Figures

List of Abbreviations

APZ	Asset Protection Zone
IPA	Inner Protection Area
LGA	Local Government Area
OPA	Outer Protection Area
PDA	Principal Development Area
PBP 2006	Planning for Bushfire Protection 2006
RFS	Rural Fire Service
RHF	Radiant Heat Flux

Note regarding maps in this report

The diagrams/site maps used in this report have been supplied by and are used with the permission of Diversi Consulting.

With regard to maps provided by the Land Information Centre, Topographic maps used with the permission of © Land and Property Information, NSW, www.lpi.gov.au

Figure 1. Proposal diagram with BAL-12.5 zone

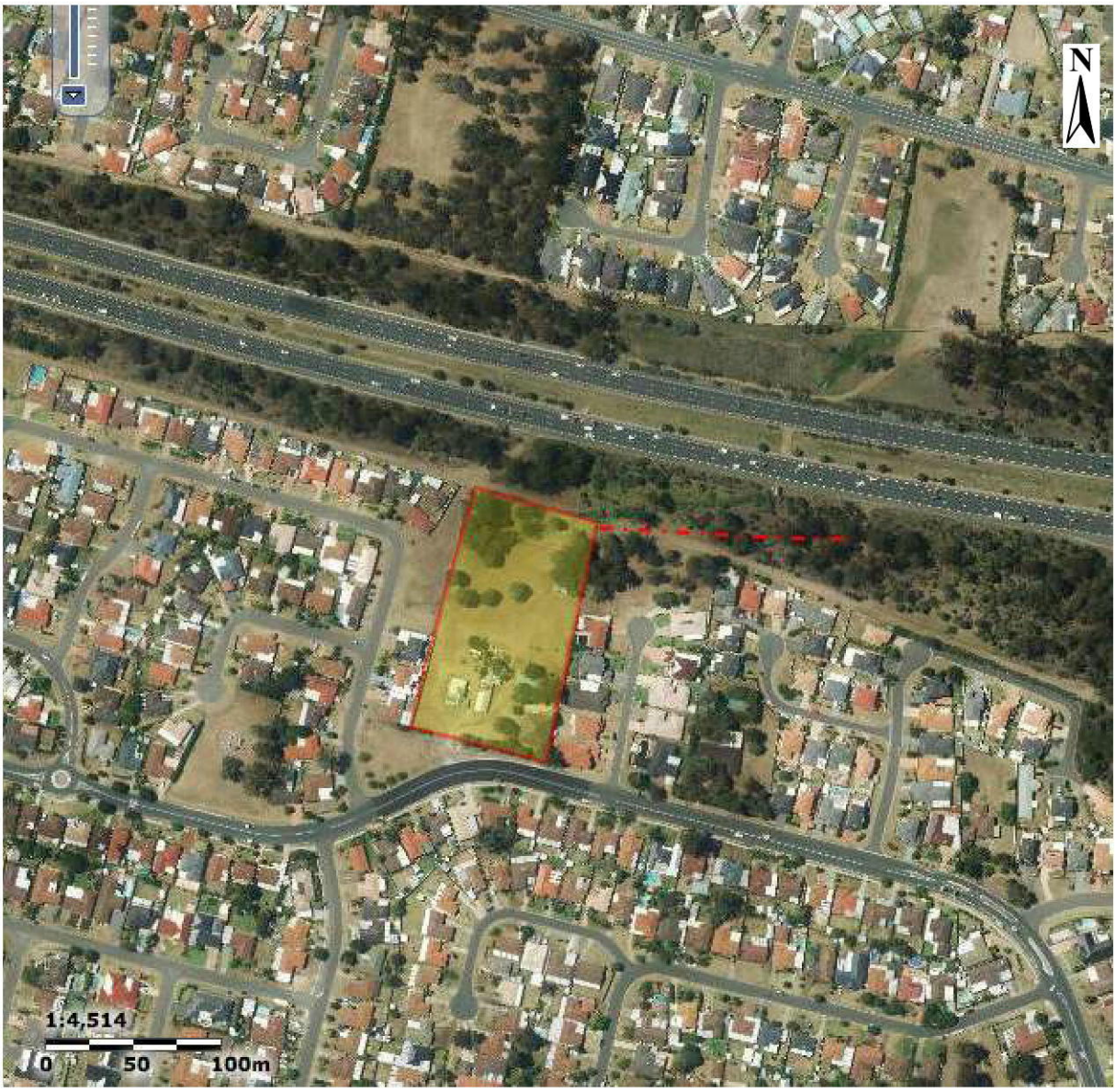


Figure 2. Air photo of the site with 140 m assessment area

Site location

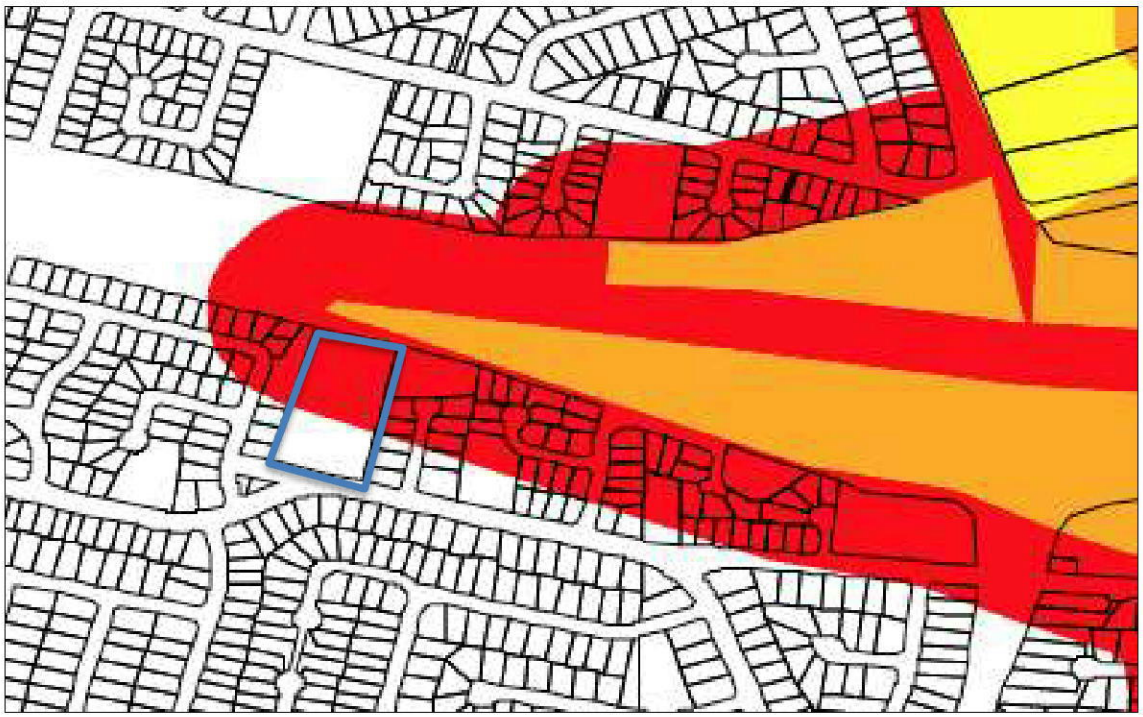


Figure 3. Bush Fire Prone Land map

Subject land
Bush Fire Prone Land – Vegetation Category 1
Bush Fire Prone Land – Vegetation Category 2
Bush Fire Prone Land – Vegetation Buffer 30 m and 100 m

Extract from the Bush Fire Prone Land Map for the Penrith Local Government Area, dated 2015.

View from proposed Lot 7 north east to M4 with all weather access track north of the fence.

View from proposed Lot 6 east to adjacent vacant land.

Figure 4. Site photos

Executive Summary

A bushfire assessment of the proposed development site at 94-100 Explorers Way, St Clair, Lot 36, DP 239502 ('the site' -Figure 1) was undertaken on 24 April 2015. The development application is to subdivide for residential use. Two dwellings and various outbuildings already exist on the allotment.

The vegetation hazard that will most significantly influence fire behaviour is the grassy woodland to the North east.

The aim of the assessment was to ascertain the potential fire hazard and establish the site capability for an Asset Protection Zone while complying with Council's requirements.

Mapped bushfire prone land to the north east is in the M4 Motorway reserve on a fill batter and has the structure of grassy woodland as landscape planting.

The site has no significant vegetation but has some scattered trees remnant from the original woodland community. There is no intact native vegetation community on the site.

The site has no threatened flora or fauna species habitat apart from some foraging opportunity as tree canopies.

The following conclusions and recommendations apply:

a) Building construction for dwellings on Lots 6, 7 and 8 along the north boundary will need to comply with the Australian Standard 3959-2009, BAL-12.5.

b) Provide a Colorbond metal fence/masonry wall/radiant heat barrier on the north boundary of the site on Lots 6, 7 and 8.

1. Introduction

We have been engaged by the owners of 94-100 Explorers Way, St Clair, Lot 36, DP 239502 (Figure 1), to prepare a bushfire assessment for a proposed residential subdivision. The report will be used to supplement a development application to Penrith Council.

We have perused the details sent to us and completed a detailed inspection of the site (Figure 2). This report serves to:

a) identify the site and proposed development,

b) determine the bushfire threat, and

c) identify work required to be completed in order to improve the chances of building survival in the event of a bushfire. These works will satisfy the Performance Requirements of BCA.

The report concludes that the site is not sterilised by the bushfire threat and the owners will be able to subdivide the land. This report concludes by providing Penrith Council with a degree of confidence that the proposal is acceptable.

1.1 Planning relationships

1.1.1 Legislation

a) Rural Fires Act 1997 (amended) s.63(1), 63(2), 100B.
b) Section 117 EP & A Act

1.1.2 Planning policies

a) Planning for Bushfire Protection 2006
b) Adjacent land is controlled by a Cumberland Zone Bushfire Risk Management Plan 2010.

1.2 Literature Review

Standards Australia (2009) AS 3959, Construction of buildings in bushfire-prone areas, Standards Australia, Sydney.

Penrith BFMC 2015, Bush Fire Prone Land Map for the Local Government Area of Penrith in New South Wales, NSW Rural Fire Service.

Keith, D. (2004) Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT. Department of Environment and Conservation (NSW), Hurstville.

2. The site and proposed development

2.1 Existing site description

On Site

The site is identified as at 94-100 Explorers Way, St Clair, Lot 36, DP 239502, (Figure 1)

The site is approximately 1.06ha in area and is zoned:
Bush Fire Prone Land, Vegetation Buffer 100 m (Figure 3).

The site is regularly shaped with a frontage of 80 metres to Explorers Way and depth of 140 metres to the east and west boundaries (Figure 1).

The site is part of an old subdivision of the suburb of St Clair, with two dwellings and a number of sheds on the site. The site has no significant vegetation but has some scattered trees remnant from the original woodland community. There is no intact native vegetation community on the site. Most natural vegetation has been cleared and the ground is mown across the site apart from a tiny low point on the north east corner. Some planted landscape trees and shrubs stand around the south end of the site and some remnant native trees grow at the north end adjacent to the M4 motorway.

The site is accessed directly from Explorers Way.

Adjacent Properties

St Clair was an old agricultural area which included various orchards and was redeveloped as a residential suburb and named St Clair in 1970. The M4 was constructed from the late 1960s to the mid 1980s and widened to six lanes from 1998 to 2000 when the present batters and parallel maintenance access tracks were constructed and landscaped.

Adjacent lands are urban residential development on the west, south and east sides. A vacant Lot to the north east has scattered Melaleuca trees with a mown lawn understorey, in fuel free condition. The motorway corridor is mapped as bushfire hazard to the east and north of the site for a band of about 40 metres adjacent to the site and widening further to 50m wide at a distance of 150m the east. That strip of vegetation is on the embankment of the motorway so is upslope of the site with an effective slope being 'upslope' (Figure 4).

2.2 Existing vegetation description

On Site

The vegetation description is according to Table A2.1 'Classification of Vegetation Formations' in PBP 2006 based on Keith, 2004. The site is fuel free and in Inner Protection Area condition (Figure 1).

Adjacent Properties

The area to the west, south and east is fuel free and in Inner Protection Area condition (Figure 1).

2.3 The proposal

The proposal is to subdivide the land for Torrens Title residential subdivision (see Figure 1).

2.4 Significant environmental features

There is a drainage swale across the northern end of the site, discharging at the north east corner to a drain under the motorway.

2.5 Threatened flora and fauna

The vegetation is remnant of a previous native vegetation community of the Cumberland Plain. No part of the land has been identified as critical habitat. There is no significant habitat on the site.

2.6 Archaeological and Heritage Significant sites

Abel Ecology is not aware of Heritage Significant sites on the land. Databases have not been searched. The site is highly disturbed and has no characteristics which would indicate potential heritage deposits. Given the history and condition of the immediate locality there is not likely to be any significant items on the site.

3. Survey methodology

Survey methods were applied in accordance with assessment methodology set in Appendix 2/3 of PBP 2006 and Table 2.4.2 of AS 3959.

The vegetation structure and location does not enable any meaningful application of bushfire attack analysis under AS3959-2009 since the assumption of a 100 metre wide fire front is not present. The topographic lines on the topographic map do not show the changes created by the M4 construction. The drainage line at the northern boundary of the site is piped under the M4 and the landform to the east shaped to drain to that pipe.

See Appendix 1 for definitions of fire management terminology.

4. Assessment of bushfire hazard

2 Hazard rating is assessed as follows:

Northern Aspect

Slope	Upslope >18˚
Effective slope	Upslope
Vegetation	Mown motorway all weather access track 8 metres wide then planted grassy woodland to 40 metres then 50 metres of motorway, then 30 metres of vegetated road batter, then urban residential area.
Achievable APZ	8 m (IPA)
Category of bushfire attack with achieved APZ Radiant Heat Flux Flame Length	Nil Not able to calculate due to short fire run Not able to calculate due to short fire run
Required building construction standard with achieved APZ	No requirement

4

Southern and Western Aspects

Slope	Level to upslope
Effective slope	Not applicable
Vegetation	Urban residential to at least 140 m
Achievable APZ	>100 m (IPA)
Category of bushfire attack with achieved APZ Radiant Heat Flux Flame Length	Nil Not applicable Not applicable
Required building construction standard with achieved APZ	No requirement

6

North Eastern Aspect

Slope	Upslope on motorway batter
Effective slope	Upslope
Vegetation	Landscaped grassy woodland and grassland to at least 140 m
Achievable APZ	10 m (IPA)
Reduced category of bushfire attack with achieved APZ Radiant Heat Flux Flame Length	Low Not able to calculate due to narrow fire front Not able to calculate due to narrow fire front
Required building construction standard with achieved APZ	BAL-12.5 for proposed Lots 6, 7, & 8.

8

Eastern Aspect

Slope	Level to upslope
Effective slope	Upslope
Vegetation	Managed land to at least 140 m
Achievable APZ	>100 m (IPA)
Reduced category of bushfire attack with achieved APZ Radiant Heat Flux Flame Length	Low Not able to calculate due to narrow fire front Not able to calculate due to narrow fire front
Required building construction standard with achieved APZ	BAL-12.5 for proposed Lot 6

5. Issues arising from the assessment

5.1 Assessment outcome

Dominant hazard

For the purpose of this report a planted landscape of grassy woodland vegetation with an upslope effective slope is assumed. The vegetation structure is very low and open so is regarded as Outer Protection Area condition. Table A2.4 of PBP proposes an APZ of 10m for this situation to achieve BAL-29 where a fire run of more than 50m and a fire front of at least 100m wide would directly approach a site.

The narrow strip of vegetation would require an easterly wind to sustain a fire. The batter of the motorway is steep and any fire will run upslope away from the residential area.

The narrow strip of vegetation is 40 metres wide at the north end of the site and any fire front will run past or away from the site, with very little depth to the fire front. This does not fulfil the assumptions of both a 100 metre wide fire front and a fire advancing directly toward the site.

Any fire will not be able to create a crown fire due to the low height and open canopy of the vegetation so the risk of ember attack is very low.

Building construction constraints

Our assessment indicates that the required building construction is BAL-12.5 as ember protection for the Lots 6, 7 and 8 on the north boundary only of the site (Figure 1).

Asset Protection Zones

Lots on the north boundary only of the site are to have landscaping to comply with Inner Protection Area condition.

No asset protection zones are required within the site.

6. Infrastructure and other requirements

6.1 Asset Protection Zone management

Residents of Lots along the north boundary will be required to maintain the grounds as Inner Protection Area condition.

The residents will be required to maintain fuel levels consistent with the provisions of the Asset Protection Zone (see Appendix 2).

6.2 Water supply

There is Sydney Water mains water supply available and a hydrant in the footpath at the street frontage. Hydrants for the subdivision are to comply with AS2419-2005 (as amended) and not to be located in any carriageway.

6.3 Access and egress

The following roads and fire trails provide adequate access for fire fighting vehicles and evacuation opportunity for residents.

Public roads

Explorers Way provides access to the front of the property. The proposed road for the subdivision will need to comply with the specifications of PBP 2006 section 4.1.3 pages 20, 21, being a turning circle head of minimum inner radius 6m and outer radius 12m with two way carriageway minimum 6.5m wide. That is to suit a turning for a Category 1 tanker medium rigid vehicle (Figure 4.1 and *Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle) PBP 2006 page 20*).

The existing proposed design is acceptable provided the footpath is clear of any obstructions in the form of poles, street furniture or parking.

Property access

Pedestrian access to the rear of the Lots on the northern boundary is required for operational activities.

Fire trails

A fire trail is not required, as there is an existing all weather maintenance track along the north boundary to service the M4 Motorway, extending from Augusta Place to the east to Newtimber Circuit to the west, with intermittent access points.

6.4 Availability of fire fighting services

The nearest Fire Station is within 4.8 km from the site at Mt Druitt.

7. Conclusion and recommendations

2 In our opinion, the site is not sterilised by the bushfire threat. The owners will therefore be able to construct the proposed dwelling with the following measures included:

4 a) Building construction for dwellings on Lots 6, 7 and 8 along the north boundary will need to comply with the Australian Standard 3959-2009, BAL-12.5.

6 b) Provide a Colorbond metal fence/masonry wall/radiant heat barrier on the north boundary of the site on Lots 6, 7 and 8.

Appendix 1. Glossary of Definitions and Terms

This section defines and explains some commonly used expressions relating to bushfires.

Bushfire (or wild fire) is generally defined to mean any unplanned fire in vegetation. Fires can also be used for land management purposes such as grazing or hazard reduction. Bushfires generally have a seasonal pattern and occur in spring and summer but can occur at other times of year under suitable conditions. The behaviour of fires is primarily influenced by:

- fuel (type, load, moisture, continuity and compaction);
- ignition source;
- topography (slope and aspect); and
- weather (humidity, temperature, wind).

Bushfire danger is a relative measure of weather conditions (temperature, drought indices, humidity and wind speed) describing the likelihood of fire ignition, spread, control difficulty and damage potential. There is currently an emphasis on prevention and suppression of bushfires to minimise damage to human life and property.

Bushfire hazard is an assessment of the particular combination of available fuel (vegetation), slope and climate/weather pattern relating to a site. This includes leaf litter and ground cover, standing fuel of the shrub and canopy layers and the season of the year. The assessment is usually rated on a scale from 'low' (or insignificant) to 'extreme' and gives a final indicator of the potential severity of a fire.

Bushfire risk means the probability of a wildfire "igniting, spreading and causing damage to assets of value to the community" (Planning for Bushfire Protection 2001). Related to this is bushfire threat which is the threat of potential damage to life and property arising from a combination of hazard, risk and bushfire danger.

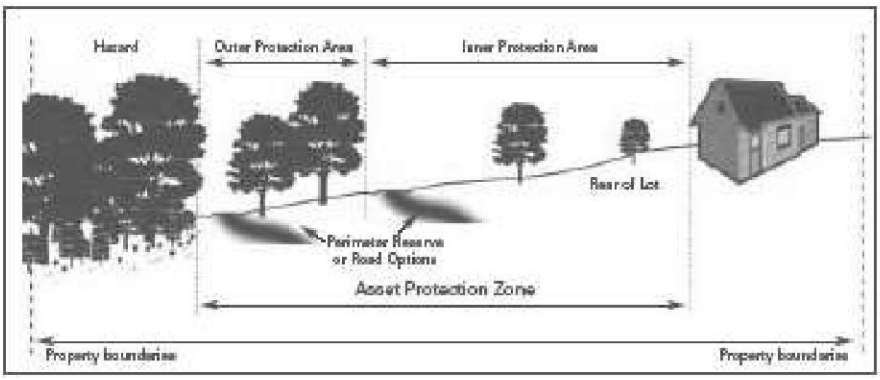
Hazard reduction means a reduction or modification of fuel by burning, chemical, mechanical or manual means.

Prescribed burn means a planned fire ignited by a land manager in accordance with a fuel management plan or for ecosystem management purposes.

Fire regime means the pattern of occurrence of fire, specifically the regularity, periodicity, seasonality, spatial extent, patchiness and intensity. This is important in terms of assessing risks and ecological impacts and is often used in prescribing a management goal to be achieved. There is debate about what constitutes a natural or pre European fire pattern. For the purpose of these definitions natural means an existence independent of human action.

Bushfire Risk Management is achieved by use of **Asset Protection Zones (APZ)**, defined by the document "Planning For Bushfire Protection" (N.S.W. Rural Fire Service). An APZ acts as a buffer zone between the development and the bushfire hazard, and consists of an Outer Protection Area (OPA) and an Inner Protection Area (IPA). The primary purpose of an Asset

Protection Zone is to ensure that a progressive reduction of bushfire fuels occurs between the bushfire hazard and any habitable structures within the development.



IPA = Inner Protection Area

Location: extends from the edge of the OPA to the development to be protected
Purpose: minimise the impact of direct flame contact and radiant heat on the development
Depth: dependent upon the slope of the land

Performance:

- Minimal fine fuel which can be set alight by a fire
- Any vegetation in the IPA does not provide a path for the transfer of fire to the development - i.e. fuels are discontinuous.

The presence of trees and shrubs in the IPA is acceptable provided that they:

- Do not touch or overhang the building;
- Do not form a continuous canopy;
- Are not species that retain dead material or deposit excessive quantities of ground fuel in a short time;
- Are located far enough away from a building that they will not ignite the building by direct flame contact or radiant heat emission.

Appendix 2. Asset Protection Zone maintenance

For this site, the Asset Protection Zone (APZ) consists of:

a) an Inner Protection Area (IPA) for Lots 6, 7 and 8.

The designated APZ is to be maintained in the following manner *(from s3.1, p.10 of Planning for Bushfire Protection 2006, and Standards for Asset Protection Zones)*. At least 75% of the ground cover must be retained after maintenance to prevent soil erosion:

Inner Protection Area

Specification

a) Trees
   i. Canopy - average cover of whole IPA less than 15%; not continuous from hazard to asset with 2-5 m separation between tree crowns; not overhanging within 2-5 m of building; islands of canopy permitted.
   ii. All lower limbs under 2 m removed
b) Trees and shrubs - retained as clumps or islands, cover less than 20% of whole area
c) Garden beds of flammable shrubs
   i. Not to be located under trees
   ii. Over 10 m from an exposed window or door

Maintenance

The IPA is to be maintained as follows:

a) Minimal fine fuel at ground level which could be set alight by a bushfire,

b) Vegetation does not provide a path for the transfer of fire to the development - that is, fuels are discontinuous

c) No trees to overhang the building

d) Trees must be well spread out and not form a canopy

e) Trees or shrubs that retain dead material or deposit excessive quantities of fuel in a short period of time must not be within the IPA

f) Trees and shrubs must be located far enough from the house that the radiant heat they produce or direct flame contact will not ignite the house.

g) Wooden sheds, combustible material, large areas/quantities of garden mulch, stacked flammable building materials etc., must not be within the IPA

Appendix 3. Fire emergency procedure

Bush Fire Survival Plan

We recommend that you prepare your own Bush Fire Survival Plan
http://www.rfs.nsw.gov.au/file_system/attachments/Attachment_BushFireSurvivalPlan.pdf

Personal safety and survival

(from s6.5 of Planning for Bushfire Protection 2001)

The survivability of a dwelling and its occupants is dependent upon the amount of preparation prior to the actual fire event.

1. As the bushfire approaches

(a) Personal Protection

Protect yourself from radiant heat by wearing:

a) cotton overalls or thicker long sleeved shirt and long pants of cotton or wool;
b) clothes which are loose fitting;
c) a strong pair of shoes or boots with woollen or cotton socks;
d) gloves, if your hands are not used to working with tools;
e) goggles, if the smoke is thick;
f) a "bandana" or large handkerchief to protect the airways from smoke and hot air;
g) a wide-brimmed hat or hard hat if one is available; but
h) leave your ears uncovered - they warn you of heat levels.

DO NOT WEAR SYNTHETICS – WEAR WOOL, COTTON OR DENIM.

(b) Protection of Children, Elderly and Pets

During the approach of a bushfire:

a) keep children, elderly and pets inside the house;
b) give them plenty of water to drink; and
c) make sure you keep track of their movements.

(c) Outside the home

a) Close windows and doors and any shutters and fit any screens.
b) Block the down pipes and fill them with water.
c) Put doormats inside.
d) Store all combustible furniture and awnings.
e) Wet down wood piles and areas of garden mulch.

(d) Inside the home

a) Fill all sinks, baths and any buckets with water and put a filled bucket in the roof.
b) Block any gaps under the doors with wet towels.
c) Place a ladder to provide access to the roof area.
d) Monitor the radio – keep a spare set of batteries.
e) Turn off any gas.

(e) The car

a) Park in a cleared area.
b) Close all doors, windows and vents.
c) Leave the keys in the ignition.
d) Store woollen blankets inside.

2. When the bushfire is close

a) Remain outside as long as possible patrolling the area for spot fires.
b) Suppress any spot fires which start close to the house or in the guttering.
c) Take refuge when the smoke starts to thicken.
d) Take your hoses and fittings inside when you move inside.
e) Activate any sprinkler system.

3. As the bushfire passes over

a) Remain calm and keep other occupants calm.
b) Move to the side of the house away from the main fire front.
c) Carry out regular inspections, particularly of windows to determine if they have shattered and embers have entered any rooms.

4. After the bushfire has passed

a) Before passing through a closed doorway, feel the door – if it is hot do not open it as there may be a fire on the other side – leave it closed to stop the fire spreading and exit via another route.
b) Check the house for fires – the roof, roof spaces and any under floor areas.
c) If the house is on fire move onto burnt out ground but keep clear of burning trees.

5. Evacuation or relocation

a) Research shows that where people are in attendance and are well prepared then dwellings are more likely to survive a bushfire. Early evacuation or relocation is a serious consideration where:
b) You are not confident that your house is prepared to withstand a bushfire;
c) You are worried about your children or elderly members of the household;
d) You suspect that you or members of the household will be unable to cope with the stress of staying;
e) It is safe to leave and you have a clear idea of where a safe refuge is to be found; and
f) You know the destination to be safe.

NOTE: YOU MUST EVACUATE IF DIRECTED TO DO SO BY THE POLICE.

a) If you do decide to relocate, or are directed to evacuate:
b) DO IT EARLY;
c) Close all doors and windows and consider leaving them unlocked – a fire fighter may need access to your home;
d) Know where you are going;
e) Drive carefully.