APPENDIX 3: KSAT RESULTS – PELLET COUNTS

Table 5: KSAT results per habitat tree.

Species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Total
Eucalyptus tereticornis	9	30	16	-	42	7	**104**
Eucalyptus crebra	91	16	29	2	0	25	**163**
Corymbia clarksoniana	11	0	0	1	4	5	**21**
Corymbia tessellaris	5	0	0	0	0	20	**25**
Corymbia dallachiana	-	12	-	-	-	-	**12**
Corymbia intermedia	-	3	1	0	11	-	**15**
Corymbia erythrophloia	-	-	0	-	0	-	**0**
Eucalyptus platyphylla	-	-	-	0	0	0	**0**
Lophostemon suaveolens	-	-	-	0	0	-	**0**
Total	**116**	**61**	**46**	**3**	**57**	**57**	

APPENDIX 4: SITE PHOTOS

The following images were taken from the centre of each BioCondition quadrat and represent a north east south west aspect, top left to bottom right.

Plate 3: BioCondition quadrat 1 (RE11.3.4/11.12.3)

Plate 4: BioCondition quadrat 2 (RE11.3.4/11.12.3)

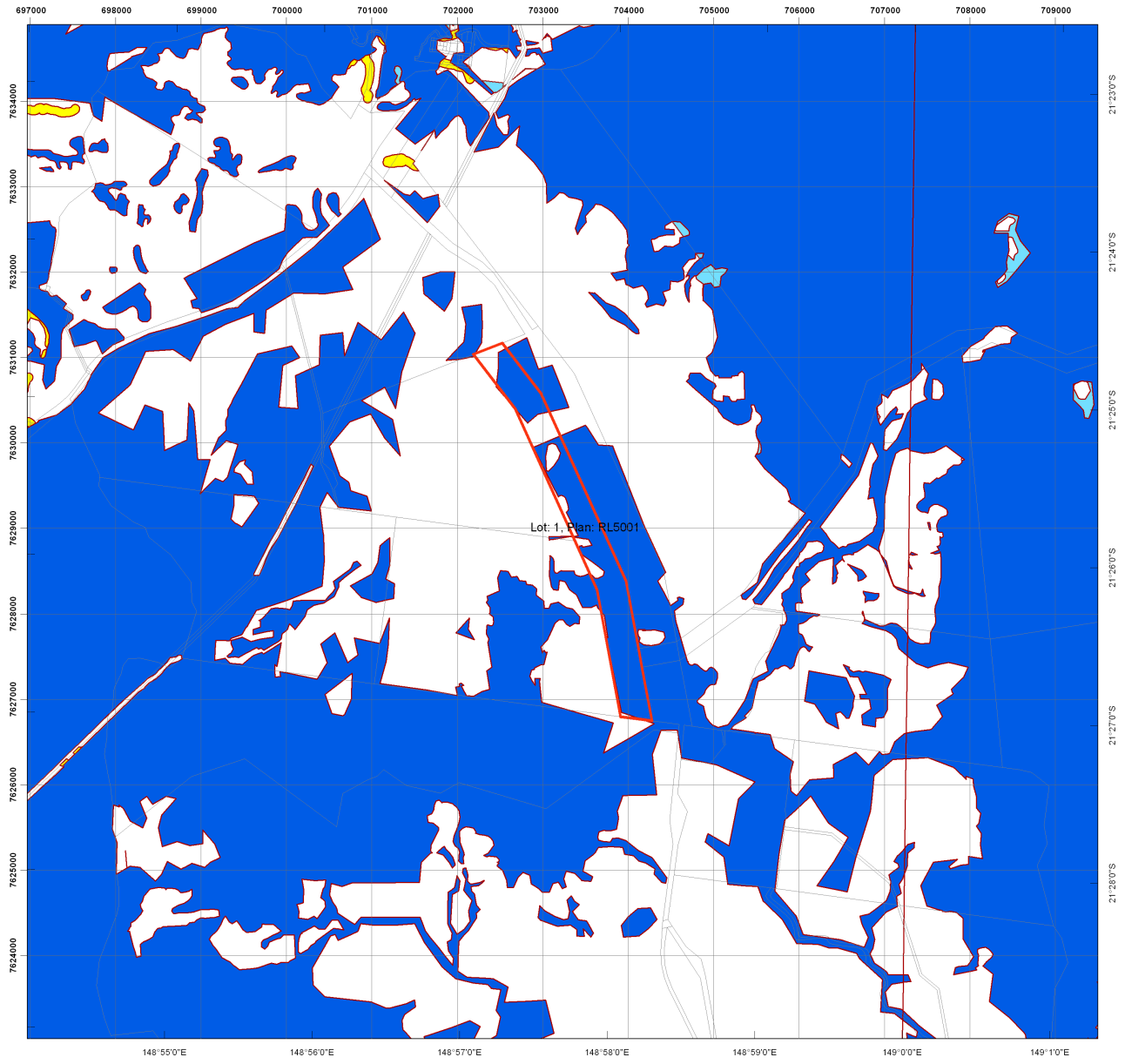
Plate 5: BioCondition quadrat 3 (RE11.12.3)

Plate 6: BioCondition quadrat 4 (RE11.3.9)

Plate 7: BioCondition quadrat 5 (RE11.3.25)

Plate 8: BioCondition quadrat 6 (RE11.12.3/11.3.4/11.3.9)

Appendix E: Desktop Assessment for Potential Offset Site



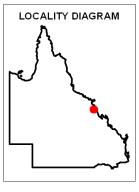
Regulated Vegetation Management Map

Legend

- Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Vegetation not regulated under the VMA)
- Water
- Area not categorised
- Cadastral line
  Property boundaries shown are provided as a locational aid only

Queensland Government

LOCALITY DIAGRAM



N

0 680 1,360 2,040 2,720 3,400 m

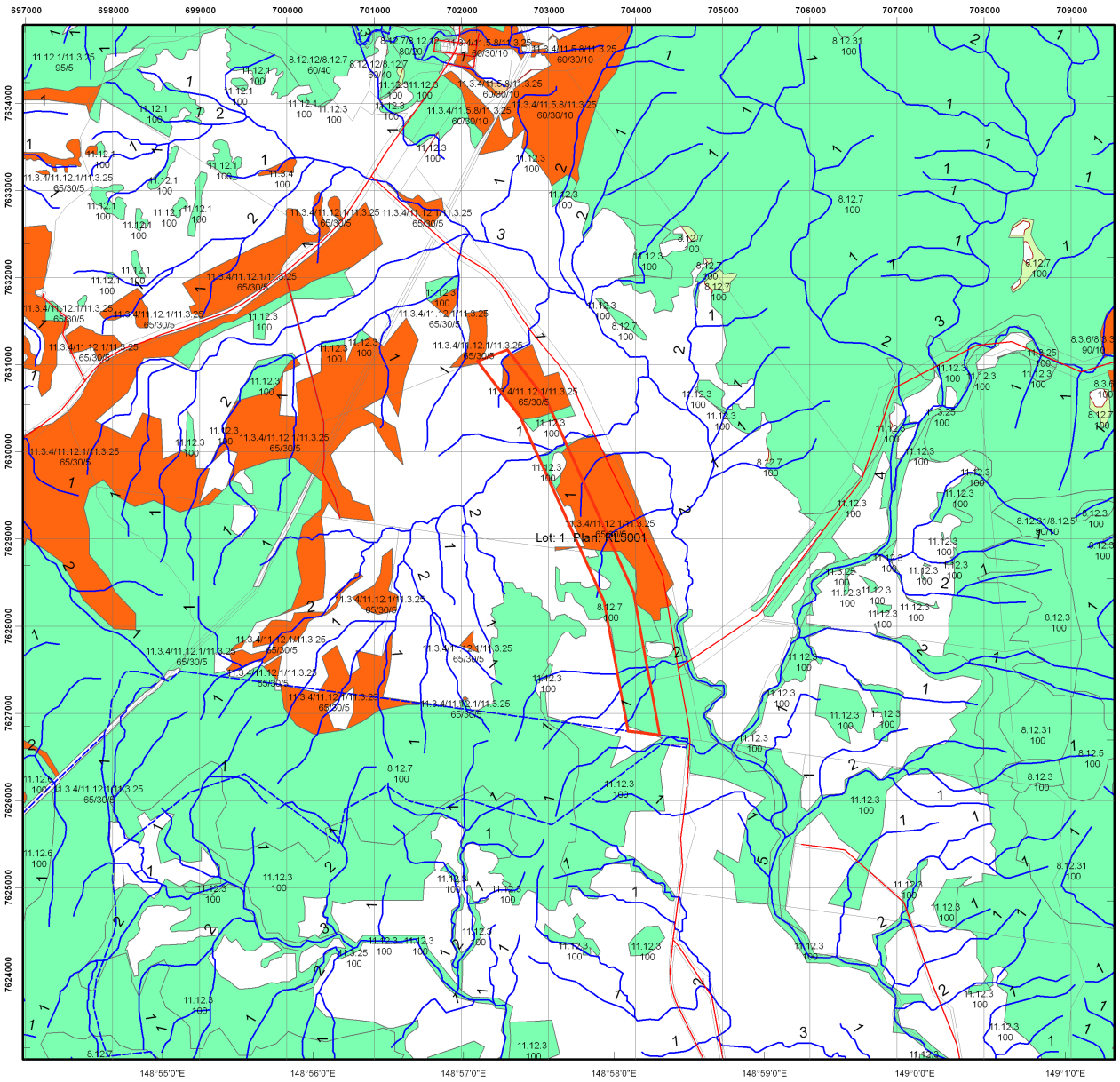
This product is projected into:
GDA 1994 MGA Zone 55

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Natural Resources and Mines makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incurr as a result of the product being inaccurate or incomplete in any way and for any reason.

Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.dnrm.qld.gov.au or contact the Department of Natural Resources and Mines.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.



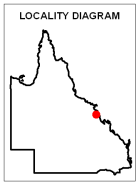
Vegetation Management Supporting Map

Legend

- Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category A or B area containing remnant vegetation
- Category A or B area under Section 20AH
  These areas are edged in yellow and filled with the remnant RE Status
- Category C area containing endangered regional ecosystems
- Category C area containing of concern regional ecosystems
- Category C area that is a least concern regional ecosystem
- Category C area containing high value regrowth vegetation
- Category C area under Section 20AI
  These areas are edged in purple and filled with the remnant RE Status
- Non Remnant
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourse on the vegetation management watercourse and drainage feature map
  (Stream order shown as black number against stream where available)
- Roads
- National Parks, State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only

Queensland Government

LOCALITY DIAGRAM



N

0 490 980 1,470 1,960 2,450 m

This product is projected into:
GDA 1994 MGA Zone 55

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Natural Resources and Mines makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incurr as a result of the product being inaccurate or incomplete in any way and for any reason.

Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.dnrm.qld.gov.au or contact the Department of Natural Resources and Mines.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Vegetation Management Act 1999 - Extract from the essential habitat database

Essential habitat is required for assessment under the:

- State Development Assessment Provisions - Module 8: Native vegetation clearing which sets out the matters of interest to the state for development assessment under the *Sustainable Planning Act 2009*; and
- Self-assessable vegetation clearing codes made under the *Vegetation Management Act 1999*

Essential habitat for one or more of the following species is found on and within 1.1 km of the identified subject lot/s or on and within 2.2 km of an identified coordinate on the accompanying essential habitat map.

This report identifies essential habitat in Category A, B and Category C areas.

The numeric labels on the essential habitat map can be cross referenced with the database below to determine which essential habitat factors might exist for a particular species.

Essential habitat is compiled from a combination of species habitat models and buffered species records.

The Department of Natural Resources and Mines website (http://www.dnrm.qld.gov.au) has more information on how the layer is applied under the State Development Assessment Provisions - Module 8: Native vegetation clearing and the *Vegetation Management Act 1999*.

Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated.

Essential habitat, for protected wildlife, means a category A area, a category B area or category C area shown on the regulated vegetation management map-

1) (a) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database; or
2) (b) in which the protected wildlife, at any stage of its life cycle, is located.

Essential habitat identifies endangered or vulnerable native wildlife prescribed under the *Nature Conservation Act 1994*.

Essential habitat in Category A and B (Remnant vegetation species record) areas:1100m Species Information

(no results)

Essential habitat in Category A and B (Remnant vegetation species record) areas:1100m Regional Ecosystems Information

(no results)

Essential habitat in Category A and B (Remnant vegetation) areas:1100m Species Information

(no results)

Essential habitat in Category A and B (Remnant vegetation) areas:1100m Regional Ecosystems Information

(no results)

Essential habitat in Category C (High value regrowth vegetation) areas:1100m Species Information

(no results)

Essential habitat in Category C (High value regrowth vegetation) areas:1100m Regional Ecosystems Information

(no results)

Atlas of Living Australia Search Results (Nov 2015)

Species Name	Scientific Name Authorship	Taxon Rank	Kingdom	Phylum	Class	Order	Family	Genus	Vernacular Name
Malurus (Musciparus) melanocephalus	(Latham, 1801)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	MALURIDAE	Malurus	Red-backed Fairy-wren
Eucalyptus melanophloia	F.Muell.	species	Plantae	Charophyta	Equisetopsida	Myrtales	Myrtaceae	Eucalyptus	Silver-leaf Ironbark
Rhipidura (Sauloprocta) leucophrys	(Latham, 1801)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	RHIPIDURIDAE	Rhipidura	Willie Wagtail
Cracticus nigrogularis	(Gould, 1837)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	ARTAMIDAE	Cracticus	Pied Butcherbird
Corvus orru	Bonaparte, 1850	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	CORVIDAE	Corvus	Torresian Crow
Microcerotermes turneri	(Froggatt, 1898)	species	ANIMALIA	ARTHROPODA	INSECTA	BLATTODEA	TERMITIDAE	Microcerotermes	
Parsonsia straminea	(R.Br.) F.Muell.	species	Plantae	Charophyta	Equisetopsida	Gentianales	Apocynaceae	Parsonsia	Common Silkpod
Eucalyptus tereticornis	Sm.	species	Plantae	Charophyta	Equisetopsida	Myrtales	Myrtaceae	Eucalyptus	Forest Red Gum
Clerodendrum floribundum	R.Br.	species	Plantae	Charophyta	Equisetopsida	Lamiales	Lamiaceae	Clerodendrum	Lolly Bush
Anas (Anas) superciliosa	Gmelin, 1789	species	ANIMALIA	CHORDATA	AVES	ANSERIFORMES	ANATIDAE	Anas	Pacific Black Duck
Aphaenogaster pythia	Forel, 1915	species	ANIMALIA	ARTHROPODA	INSECTA	HYMENOPTERA	FORMICIDAE	Aphaenogaster	
Porphyrio (Porphyrio) porphyrio	(Linnaeus, 1758)	species	ANIMALIA	CHORDATA	AVES	GRUIFORMES	RALLIDAE	Porphyrio	Purple Swamphen
Aphaenogaster barbara	Shattuck, 2008	species	ANIMALIA	ARTHROPODA	INSECTA	HYMENOPTERA	FORMICIDAE	Aphaenogaster	
Philemon (Microphilemon) citreogularis	(Gould, 1837)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	MELIPHAGIDAE	Philemon	Little Friarbird
Coracina (Coracina) novaehollandiae	(Gmelin, 1789)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	CAMPEPHAGIDAE	Coracina	Black-faced Cuckoo-shrike
Geopelia striata	(Linnaeus, 1766)	species	ANIMALIA	CHORDATA	AVES	COLUMBIFORMES	COLUMBIDAE	Geopelia	Peaceful Dove
Philemon (Tropidorhynchus) corniculatus	(Latham, 1790)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	MELIPHAGIDAE	Philemon	Noisy Friarbird
Anthus (Anthus) novaeseelandiae	(Gmelin, 1789)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	MOTACILLIDAE	Anthus	Australasian Pipit
Nettapus (Cheniscus) coromandelianus	(Gmelin, 1789)	species	ANIMALIA	CHORDATA	AVES	ANSERIFORMES	ANATIDAE	Nettapus	Cotton Pygmy-goose
Anas (Nettion) gracilis	Buller, 1869	species	ANIMALIA	CHORDATA	AVES	ANSERIFORMES	ANATIDAE	Anas	Grey Teal
Microeca (Microeca) flavigaster	Gould, 1843	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	PETROICIDAE		Lemon-bellied Flycatcher
Hypseleotris compressa	(Krefft, 1864)	species	ANIMALIA	CHORDATA	ACTINOPTERYGII	PERCIFORMES	ELEOTRIDAE	Hypseleotris	Empire Gudgeon
Trichoglossus chlorolepidotus	(Kuhl, 1820)	species	ANIMALIA	CHORDATA	AVES	PSITTACIFORMES	PSITTACIDAE	Trichoglossus	Scaly-breasted Lorikeet
Pardalotus (Pardalotinus) striatus	(Gmelin, 1789)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	PARDALOTIDAE	Pardalotus	Striated Pardalote
Ardea (Bubulcus) ibis	Linnaeus, 1758	species	ANIMALIA	CHORDATA	AVES	CICONIIFORMES	ARDEIDAE	Ardea	Cattle Egret
Tachybaptus novaehollandiae	(Stephens, 1826)	species	ANIMALIA	CHORDATA	AVES	PODICIPEDIFORMES	PODICIPEDIDAE	Tachybaptus	Australasian Grebe
Dendrocygna (Dendrocygna) arcuata	(Horsfield, 1824)	species	ANIMALIA	CHORDATA	AVES	ANSERIFORMES	ANATIDAE	Dendrocygna	Wandering Whistling-duck
Microcarbo melanoleucos	(Vieillot, 1817)	species	ANIMALIA	CHORDATA	AVES	PELECANIFORMES	PHALACROCORACIDAE	Microcarbo	Little Pied Cormorant
Myzomela (Cosmeteira) obscura	Gould, 1843	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	MELIPHAGIDAE	Myzomela	Dusky Honeyeater
Grallina cyanoleuca	(Latham, 1801)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	MONARCHIDAE	Grallina	Magpie-lark
Anseranas semipalmata	(Latham, 1798)	species	ANIMALIA	CHORDATA	AVES	ANSERIFORMES	ANSERANATIDAE	Anseranas	Magpie Goose
Smicrornis brevirostris	(Gould, 1838)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	ACANTHIZIDAE	Smicrornis	Weebill
Trichoglossus haematodus	(Linnaeus, 1771)	species	ANIMALIA	CHORDATA	AVES	PSITTACIFORMES	PSITTACIDAE	Trichoglossus	Rainbow Lorikeet
Merops (Merops) ornatus	Latham, 1801	species	ANIMALIA	CHORDATA	AVES	CORACIIFORMES	MEROPIDAE	Merops	Rainbow Bee-eater
Lichmera (Lichmera) indistincta	(Vigors & Horsfield, 1827)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	MELIPHAGIDAE	Lichmera	Brown Honeyeater
Petrochelidon (Hylochelidon) nigricans	(Vieillot, 1817)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	HIRUNDINIDAE	Petrochelidon	Tree Martin
Anhinga novaehollandiae	(Gould, 1847)	species	ANIMALIA	CHORDATA	AVES	PELECANIFORMES	ANHINGIDAE	Anhinga	Australasian Darter
Petrochelidon (Petrochelidon) ariel	(Gould, 1842)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	HIRUNDINIDAE	Petrochelidon	Fairy Martin
Centropus (Polophilus) phasianinus	(Latham, 1801)	species	ANIMALIA	CHORDATA	AVES	CUCULIFORMES	CENTROPODIDAE	Centropus	Pheasant Coucal
Pachycephala (Alisterornis) rufiventris	(Latham, 1801)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	PACHYCEPHALIDAE	Pachycephala	Rufous Whistler
Dendrocygna (Leptotarsis) eytoni	(Eyton, 1838)	species	ANIMALIA	CHORDATA	AVES	ANSERIFORMES	ANATIDAE	Dendrocygna	Plumed Whistling-duck
Cracticus tibicen	(Latham, 1801)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	ARTAMIDAE	Cracticus	Australian Magpie
Irediparra gallinacea	(Temminck, 1828)	species	ANIMALIA	CHORDATA	AVES	CHARADRIIFORMES	JACANIDAE	Irediparra	Comb-crested Jacana
Ardea (Casmerodius) modesta	J.E. Gray, 1831	species	ANIMALIA	CHORDATA	AVES	CICONIIFORMES	ARDEIDAE	Ardea	Eastern Great Egret
Vanellus (Lobipluvia) miles	(Boddaert, 1783)	species	ANIMALIA	CHORDATA	AVES	CHARADRIIFORMES	CHARADRIIDAE	Vanellus	Masked Lapwing
Neochmia (Aegintha) temporalis	(Latham, 1801)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	ESTRILDIDAE	Neochmia	Red-browed Finch
Gallinula (Gallinula) tenebrosa	Gould, 1846	species	ANIMALIA	CHORDATA	AVES	GRUIFORMES	RALLIDAE	Gallinula	Dusky Moorhen
Dacelo (Dacelo) leachii	Vigors & Horsfield, 1827	species	ANIMALIA	CHORDATA	AVES	CORACIIFORMES	ALCEDINIDAE	Dacelo	Blue-winged Kookaburra
Myiagra (Myiagra) rubecula	(Latham, 1801)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	MONARCHIDAE	Myiagra	Leaden Flycatcher
Phascolarctos cinereus	(Goldfuss, 1817)	species	ANIMALIA	CHORDATA	MAMMALIA	DIPROTODONTIA	PHASCOLARCTIDAE	Phascolarctos	Koala
Colluricincla (Colluricincla) harmonica	(Latham, 1801)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	PACHYCEPHALIDAE	Colluricincla	Grey Shrike-thrush
Myzomela (Myzomela) sanguinolenta	(Latham, 1801)	species	ANIMALIA	CHORDATA	AVES	PASSERIFORMES	MELIPHAGIDAE	Myzomela	Scarlet Honeyeater
Sorghum nitidum	(Vahl) Pers.	species	Plantae	Charophyta	Equisetopsida	Poales	Poaceae	Sorghum	
Sporobolus jacquemontii	Kunth	species	Plantae	Charophyta	Equisetopsida	Poales	Poaceae	Sporobolus	American Ratstail Grass
Eragrostis spartinoides	Steud.	species	Plantae	Charophyta	Equisetopsida	Poales	Poaceae	Eragrostis	
Paspalidium distans	(Trin.) Hughes	species	Plantae	Charophyta	Equisetopsida	Poales	Poaceae	Paspalidium	Spreading Panic-grass
Urochloa mutica	(Forssk.) T.Q.Nguyen	species	Plantae	Charophyta	Equisetopsida	Poales	Poaceae	Urochloa	Para Grass
Ageratum conyzoides	L.	species	Plantae	Charophyta	Equisetopsida	Asterales	Asteraceae	Ageratum	Billygoat Weed
Fimbristylis tristachya	R.Br.	species	Plantae	Charophyta	Equisetopsida	Poales	Cyperaceae	Fimbristylis	

Australian Government

Department of the Environment

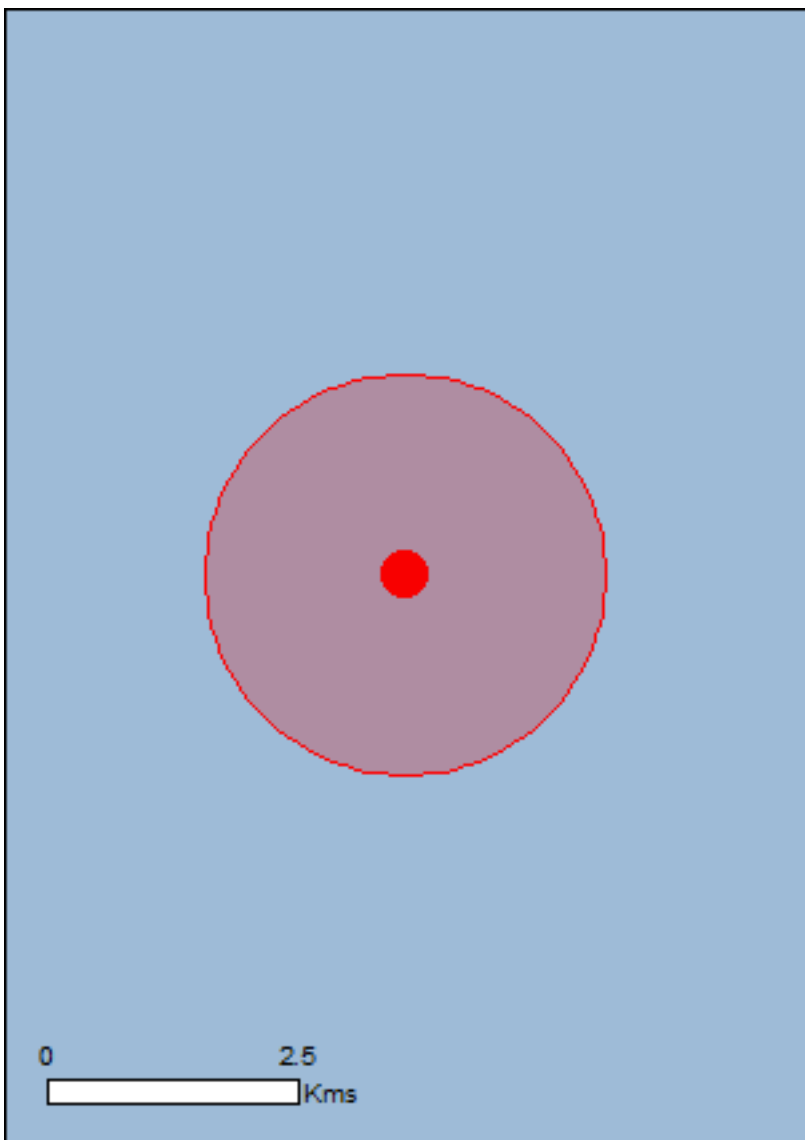
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

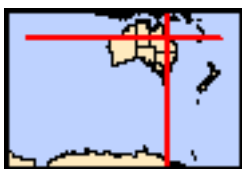
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 24/11/15 15:02:01



Coordinates

Buffer: 2.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	17
Listed Migratory Species:	12

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	22
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat likely to occur within area
Neochmia ruficauda ruficauda Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasyurus hallucatus Northern Quoll [331]	Endangered	Species or species habitat likely to occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Rhinolophus robertsi Large-eared Horseshoe Bat, Greater Large-eared Horseshoe Bat [87639]	Endangered	Species or species habitat may occur within area
Other		

Name	Status	Type of Presence
Cycas ophiolitica [55797]	Endangered	Species or species habitat likely to occur within area
Plants		
Eucalyptus raveretiana Black Ironbox [16344]	Vulnerable	Species or species habitat likely to occur within area
Omphalea celata [64586]	Vulnerable	Species or species habitat likely to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Reptiles		
Denisonia maculata Ornamental Snake [1193]	Vulnerable	Species or species habitat may occur within area
Egernia rugosa Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area
Rheodytes leukops Fitzroy River Turtle, Fitzroy Tortoise, Fitzroy Turtle, White-eyed River Diver [1761]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur

Name	Threatened	Type of Presence within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]		
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-21.4407 148.9676

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Parks and Wildlife Commission NT, Northern Territory Government
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Status: All
Records: All
Date: All
Latitude: -21.4407
Longitude: 148.9676
Distance: 2
Email: timothy.b.dalton@tmr.qld.gov.au
Date submitted: Tuesday 24 Nov 2015 14:03:38
Date extracted: Tuesday 24 Nov 2015 14:10:12

The number of records retrieved = 24

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Acanthizidae	*Smicrornis brevirostris*	weebill		C		1
animals	birds	Artamidae	*Cracticus nigrogularis*	pied butcherbird		C		1
animals	birds	Artamidae	*Cracticus tibicen*	Australian magpie		C		1
animals	birds	Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike		C		1
animals	birds	Columbidae	*Geopelia striata*	peaceful dove		C		1
animals	birds	Corvidae	*Corvus orru*	Torresian crow		C		1
animals	birds	Estrildidae	*Neochmia temporalis*	red-browed finch		C		1
animals	birds	Hirundinidae	*Petrochelidon ariel*	fairy martin		C		1
animals	birds	Maluridae	*Malurus melanocephalus*	red-backed fairy-wren		C		1
animals	birds	Meliphagidae	*Myzomela sanguinolenta*	scarlet honeyeater		C		1
animals	birds	Meliphagidae	*Philemon citreogularis*	little friarbird		C		1
animals	birds	Meliphagidae	*Philemon corniculatus*	noisy friarbird		C		1
animals	birds	Meliphagidae	*Lichmera indistincta*	brown honeyeater		C		1
animals	birds	Meliphagidae	*Myzomela obscura*	dusky honeyeater		C		1
animals	birds	Monarchidae	*Myiagra rubecula*	leaden flycatcher		C		1
animals	birds	Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		C		1
animals	birds	Pachycephalidae	*Colluricincla harmonica*	grey shrike-thrush		C		1
animals	birds	Pardalotidae	*Pardalotus striatus*	striated pardalote		C		1
animals	birds	Petroicidae	*Microeca flavigaster*	lemon-bellied flycatcher		C		1
animals	birds	Psittacidae	*Trichoglossus chlorolepidotus*	scaly-breasted lorikeet		C		1
animals	birds	Psittacidae	*Trichoglossus haematodus moluccanus*	rainbow lorikeet		C		1
animals	birds	Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		C		1
plants	higher dicots	Apocynaceae	*Parsonsia straminea*	monkey rope		C		1/1
plants	higher dicots	Lamiaceae	*Clerodendrum floribundum*			C		1/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.* The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.* The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

Appendix F: ERRP Fauna Assessment Report (EcoSM, 2013)

ETON RANGE REALIGNMENT PROJECT
FAUNA ASSESSMENT REPORT

Department of Transport and Main Roads

December 2013

ecological survey & management

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1. Introduction

Ecological Survey & Management was engaged by the Department of Transport and Main Roads to undertake a fauna and habitat assessment of an area proposed for realignment of the Peak Downs Highway crossing of the Eton Range, approximately 40 km south-west of Mackay (Figure 1). This area of the Peak Downs Highway is known as Spencer Gap.

The objective of the fauna and habitat assessment was to identify key fauna constraints within the area of interest (the Study Area) to inform design and approvals required for the Project.

1.1. Background

A number of studies have been undertaken as part of the route selection and design of the Project, including:

- 2010 Ecological Assessment Report Peak Downs Highway Realignment Eton Range Crossing undertaken by Ecological Survey & Management
- 2013 Eton Range Upgrade Project – Options Q1a-W21 and X1A-X2A undertaken by Ecological Survey & Management.

These surveys largely focused on vegetation and flora assessment and mapping. This current assessment expands on the results of these previous surveys by assessing the fauna values of the Study Area.

Additionally, the Study Area has been altered since the 2010 and 2013 surveys were undertaken and this assessment addresses the vegetation mapping and threatened flora values of the expanded Study Area.

1.1.1. Scope of works

This assessment involved:

- Review of existing information such as existing field-validated regional ecosystem (RE) mapping and previous assessments, aerial photography and relevant database searches such as Queensland Museum, Wildlife Online and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool
- Undertake a four (4) day fauna assessment to assess quality of habitats and apply targeted survey techniques aimed at identifying significant fauna species
- Identify potential breeding places, such as bird nests, hollow-bearing trees and caves within the Study Area
- Prepare significance assessments for EPBC Act listed fauna species known or considered likely to occur in the Study Area
- Undertake a one (1) day vegetation mapping exercise to capture REs in the expanded Study Area and map additional locations of Significant species known to occur in the area.

2. Methods

2.1. Desktop Review

A number of database and mapping sources were reviewed as part of this assessment and were used to target field survey methods for the Study Area. Sources included:

- EPBC Act Protected Matters Search Tool (SEWPaC 2013b)
- Wildlife Online database (EHP 2013)
- Queensland Museum Database (Queensland Museum 2013)
- Vegetation Management Regional Ecosystem and Remnant Map (Version 8.0) (NRM 2013b) and Essential Habitat Map (Version 4.0) (NRM 2013a)
- Nearmap 2011 Aerial photography
- Atlas of Groundwater Dependent Ecosystems (National Water Commission 2013).

2.2. Field Survey

A total of 11 survey sites were established throughout the Study Area that combined a number of survey techniques in order to target the range of significant fauna species that potentially occur in the Study Area. A description of these techniques and survey effort is described in Sections 2.2.1 – 2.2.8. The distribution of survey techniques employed throughout the Study Area is shown on Figure 1.

2.2.1. Spotlighting

Spotlighting was undertaken on foot over three nights for a total of 18 person hours. The distinctive calls of some fauna were also used to identify their presence. All habitat types were spotlighted during the survey period.

2.2.2. Call playback

Call playback involved broadcasting a recorded call of an owl or arboreal mammals through a megaphone in an effort to elicit a territorial response from any animals that hear the call. Animals either call in response to the recording and/or move in to the location that the call was played from. The call is played and then approximately 2 to 3 minutes are spent listening for a response and looking for animals that have moved into the area without calling. Call playback was undertaken at six sites. Following the call playback session, spotlighting was conducted of the immediate area to locate any owls that had flown into the area without calling and had not been seen during the call playback. The calls of the following species were played:

- Barking Owl (*Ninox connivens*)
- Masked Owl (*Tyto novaehollandiae*)
- Southern Boobook (*Ninox novaeseelandiae*)

- Barn Owl (*Tyto alba*)
- Koala (*Phascolarctos cinereus*)

2.2.3. Active Searching

Active searching was conducted to detect reptiles, frogs and small ground dwelling mammals. It involved the searching of suitable microhabitat such as logs, bark, deep leaf litter, surface rocks and shedding bark. Active searching was undertaken at five sites for a total of 10 person hours across the Study Area.

2.2.4. Anabat

The Anabat surveys involved the use of an SD1 Anabat detector to record the echolocation calls of micro-bats as they forage. A sonogram was then produced suing software that allows for comparison against reference calls for identified. Unfortunately, some species of bat have very similar and/or quiet calls and cannot be positively distinguished via Anabat (e.g. *Nyctophilus* species). Therefore, a probability rating is provided for calls identified. All Anabat calls were analysed by Greg Ford, a specialist in analysing Anabat recordings.

Anabat units were deployed for one night from dusk until dawn at 6 locations across the Study Area. Anabat survey sites were selected on the basis of having suitable flyways, flowering trees that attract insects or water that attracts insects and bats.

2.2.5. Koala Line Transects

The Wildlife Online search indicated that the Koala had been previously recorded from the search area. Therefore, targeted line transects were conducted in the Study Area to provide information in relation to the use of the Study Area by this species. In line with the Interim Koala Referral Advice for Proponents (SEWPaC 2012b), line transects were stratified across the Study Area to establish an estimate of population density, distribution and habitat preferences.

The methodology employed for the line transects involved two ecologists walking a distance of 25 m apart for a length of 500 m on one side of a centreline and then returning along the other side of the 500 m centreline also remaining a distance of 25 m apart, while inspecting each tree along this transect. This results in a search area of 5 ha (500 m x 100 m search area) for each transect. In total, five line transects were conducted, with 25 ha of potential habitat actively searched for this species in the Study Area.

For trees where a Koala or evidence of a Koala was identified, the type of observation, species of the tree and location were noted.

2.2.6. Infrared Cameras

Cameras were set on a bait station of a chicken frame, apple and sweet potato. Cameras were set at 5 sites across the Study Area for a duration of four nights each.

2.2.7. Bird Surveys

Bird surveys were conducted at each of the 11 survey sites, with all birds seen and heard recorded. Eleven person hours were spent conducting bird surveys throughout the Study Area. Opportunistic records of birds were also made while undertaking other activities throughout the Study Area. Approximately 60 person hours were spent undertaking opportunistic bird surveys during the field survey.

2.2.8. Opportunistic Observations

Records of fauna in the Study Area were also made opportunistically while undertaking other activities, such as moving between trap sites, throughout the survey periods.

2.3. Habitat Assessment

The BioCondition Assessment Methodology (Eyre et al. 2011) was developed by the former Queensland Environmental Protection Agency to provide a methodology for the rapid assessment of terrestrial ecosystem condition. The methodology is similar to the Habitat Hectare and BioMetric methodologies developed in Victoria and New South Wales respectively.

The BioCondition methodology provides a measure of the condition of a 'patch' of vegetation in comparison to the same vegetation in its 'undisturbed' or pre-European state. This involves the assessment of a patch of vegetation against a 'benchmark'. For example, the number of large trees in a patch is measured and compared against the number of benchmark large trees for that vegetation type, and scored accordingly. A BioCondition assessment provides a condition score for a patch of vegetation as a score out of 100.

To date a comprehensive set of benchmarks for REs has yet to be developed. In this case the user is required to identify and assess the best available patch of vegetation of the same type, in a similar landscape context within the region, to use as a benchmark.

Due to the practical limitations of identifying a suitable and accessible reference site to determine a benchmark for the relevant vegetation type, Ecological Survey & Management developed a simplified BioCondition methodology to enable a rapid assessment of vegetation condition that generally follows the BioCondition methodology without the requirement for a benchmark reference site. The modified methodology is based on judgement of the difference of the vegetation from undisturbed conditions. While this greatly increases the subjectivity of the assessment it still provides an objective assessment framework and is considered an improvement on purely subjective assessments of habitat and vegetation condition.

However, without a benchmark it is not possible to conduct some parts of the BioCondition assessment. Specifically, these are the assessment of native species richness within each life form and the detailed assessment of native grass cover, native herb and forb cover, and native annual species cover. This simplified methodology includes an assessment of the level of cover of native species in the understorey against what would be

expected in an undisturbed example of the vegetation type. Therefore, the modified assessment provides a score out of 85 that is then multiplied by 1.176 to obtain a score out of 100.

Once a score out of 100 is developed, this is then compared to Table 1, to rate the patch of vegetation on a scale of 1 to 4, whereby 1 represents vegetation of good biodiversity condition and 4 represents poor biodiversity condition.

Table 1: Categorisation of BioCondition Scores

Condition Class	BioCondition Score
1	>85 %
2	>or= 70 – 84 %
3	>or= 60 – 69 %
4	<6 %

This methodology was applied at 17 habitat assessment sites throughout the Study Area (Figure 1). Sites were chosen to represent each polygon or patch, as well as provide duplicates where possible for each RE occurring within the Study Area. A series of vegetation attributes were assessed at each site to establish using scores outlined in the BioCondition Assessment Methodology (Eyre et al. 2011), including:

- Canopy cover and health
- Canopy recruitment
- Canopy height
- Shrub layer
- Ground cover
- Large trees
- Fallen logs
- Weed cover
- Organic litter
- Size of patch
- Connectivity
- Context.

2.4. Significant Species Assessment

Database searches identified significant species that potentially occur within the Study Area. The likelihood of such species occurring was then assessed based on the results of the field assessment.

The likelihood of species occurring within the Study Area was classified using the criteria presented in Table 2. The assessment was based on the

species' known ranges and habitat preferences, which were evaluated based on characteristics of the Study Area observed during field surveys.

Table 2: Criteria to assess potential for species to occur in the Study Area

Likelihood to Occur	Definition
Present	The species was recorded within the Study Area during the field surveys.
High	The species was not recorded within the Study Area during field surveys, but is known to occur within the surrounding area, and habitat of suitable quality exists within the Study Area.
Moderate	The species was not recorded within the Study Area during field surveys, although it is known to occur in the wider region. Habitat was identified for the species in the Study Area during the field surveys, however, it is marginal, fragmented and/or small in size, or degraded.
Low	The species was not recorded within the Study Area during the field surveys. The species is either: a) Unlikely to occur in the wider region and due to the lack of, or extremely poor quality habitat in the Study Area, the species is not expected to occur within the Study Area b) May forage periodically in the wider region and may overfly the Study Area, but the habitat in the Study Area is generally not suitable.

2.4.1. Impact Assessments

For species listed under the EPBC Act that were recorded or considered to have a high likelihood of occurring in the Study Area, the significance of impacts was assessed in accordance with the Significant Impact Guidelines (DoE 2013c).

Species of a moderate or lower likelihood of occurring in the Study Area were not assessed against the Significant Impact Guidelines as the Study Area is not considered to provide good quality or important habitat for these species due to:

- the relatively small area of impact
- the highly disturbed nature of the Study Area as a result of the existence of the Peak Downs Highway
- extensive and more intact habitat to the east and west of the Study Area in the Eton and Connors Ranges.

Therefore, there is a high confidence that impacts to these species would not be significant.

There is no prescribed methodology for the assessment of potential impacts under the NC Act or the subordinate NC Regulation. Assessments of the potential impacts to species listed under the NC Act were undertaken on the basis of the species' known ecology, project design and potential mitigation measures.

2.5. Fauna Field Survey Standards

The Queensland Government has developed Terrestrial Vertebrate Fauna Survey Guidelines (DSITIA 2012) that outline recommended survey effort and techniques for survey of terrestrial vertebrate fauna in Queensland.

Similarly, the Commonwealth Government has developed a series of specific guidelines tailored to the threatened species being targeted e.g. threatened reptiles, bats, birds, fish and mammal species.

These guidelines have been considered in development of survey methods for this Project, particularly with regard to survey timing and techniques employed to target significant species most likely to occur in the Study Area.

2.6. Limitations

Ecological survey often fails to record all species of flora and fauna present on a site for a variety of reasons, such as seasonal absence or reduced activity during certain seasons. Furthermore, the ecology and nature of Significant and/or cryptic species means that such species are potentially not recorded during short survey periods.

Therefore, it is possible that some fauna species that have a larger home range may not have been detected in the Study Area during the fauna survey periods.

This assessment overcomes these limitations by assessing impacts not only on species recorded during the field survey, but on species that are potentially present (based on known distribution and habitat availability).

3. Results

3.1. Fauna

3.1.1. Habitat and Landscape Connectivity

The maintenance of landscape connectivity between patches of habitat is a fundamental aspect of conservation ecology (Endler 1977; Forman 1995). Habitat corridors are often recommended to maintain and/or enhance landscape connectivity (Bennett et al. 1999).

The Study Area lies within a large connected landscape of remnant vegetation associated with the Eton and Connors Ranges. This landscape corridor links important refuges of Spencer Gap State Forest and Ben Mohr State Forest in close proximity to the Study Area and Crediton State Forest, Homevale National Park and Eungella National Park further west and north-west of the Study Area.

A first order stream is located in the north of the Study Area and flows in a northerly direction towards Sandy Creek.

3.1.2. Habitat Assessment

Using the modified BioCondition methodology, habitat condition scores were established for 17 sites within the Study Area, representing each of the four REs occurring in the Study Area. These scores are presented in Table 3. The Study Area presented an average condition score of 68.9, which falls within the condition class of 3. However, patches within REs 8.12.3, 8.12.5 and 8.12.7 represented relatively good condition, with score categories of 1 and 2 (Table 3).

The relatively low average condition score for the Study Area is most likely a reflection of the existing disturbance within the Study Area, resulting from the existing Peak Downs Highway. The cleared corridor and associated edge effects degrade the overall quality of vegetation and habitat.

Table 3: Modified BioCondition Scores for each of the 17 habitat assessment sites within the Study Area

Site Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Regional Ecosystem	8.12.3	8.12.12	8.12.5	8.12.3	8.12.12	8.12.3	8.12.5	8.12.7	8.12.7	8.12.12	8.12.7	8.12.7	8.12.12	8.12.7	8.12.7	8.12.7	8.12.7
Canopy cover and Health	5	5	5	5	5	5	5	5	5	5	5	3	5	4	5	3	5
Canopy Recruitment	3	3	3	5	0	5	3	3	3	3	3	5	3	0	3	5	3
Canopy Height	5	3	3	3	5	5	5	3	3	3	5	3	3	3	5	3	3
Shrub Layer	5	3	5	5	3	5	5	5	5	5	5	3	5	3	5	3	5
Ground Cover	10	2	10	6	0	10	6	10	10	6	10	6	6	6	2	2	10
Large Trees	8	3	3	8	3	8	8	3	8	3	6	8	3	0	3	3	1
Fallen Logs	3	2	2	3	2	3	2	4	2	2	2	4	2	2	2	0	4
Weed cover	5	0	10	5	0	10	5	10	10	5	5	3	3	3	3	0	10
Organic Litter	5	3	5	5	3	5	5	5	5	5	5	5	3	3	3	3	5
Size of Patch	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Connectivity	5	5	5	5	5	5	5	5	5	5	5	5	5	5	2	4	5
Context	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	5

Site Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Total	69	44	66	65	41	76	64	68	71	57	66	60	53	44	47	40	66
Total /100	81	52	78	76	48	89	75	80	83	67	78	71	62	52	55	47	78
BioCondition Score Category (Eyre et al. 2011)	2	4	2	2	4	1	2	2	2	3	2	2	3	4	4	4	2

3.1.3. Fauna Diversity

The fauna survey resulted in records of 73 species in the Study Area, including 3 amphibians, 53 birds, 9 mammals and 8 reptiles.

Amphibians

Three amphibians were recorded during the survey, one of these being the introduced Cane Toad (**Rhinella marina*), which was recorded at most sites in most habitats (Appendix A). The two native species were recorded at one site only, Site 4 (Figures 1 and 2).

Birds

A total of 53 bird species were recorded during the survey with most species commonly recorded at Sites 7, 8, 9 10 and 11. The most commonly occurring species were Cicadabird (*Coracina tenuirostris*), Australian Brush-turkey (*Alectura lathami*), Leaden Flycatcher (*Myiagra rubecula*), Rufous Whistler (*Pachycephala rufiventris*), Torresian Crow (*Corvus orru*). The dry rainforest along the creek lines was the most diverse habitat type (8.12.3).

One species, the Spectacled Monarch (*Monarcha trivirgatus*), recorded in the Study Area is listed as Migratory under the Migratory provisions of the Commonwealth EPBC Act. This species and the potential for other significant species to occur in the Study Area is discussed in Section 3.1.4.

Habitat for a range of bird species occurs throughout the Study Area and a number of potential habitat trees, suitable for nesting bird species have been recorded in the Study Area. These habitat trees are shown on Figure 3 and described in Appendix A.

Mammals

Field surveys recorded 28 mammal species in the Study Area, including at least 15 species of microchiropteran bat. Another 3 recorded bat calls could not be reliably identified due to poor call quality and/or known call similarities between sympatric species (Ford 2013). One exotic mammal, the Wild Dog/Dingo (**Canis lupus*) was recorded.

One species, the Koala (*Phascolarctos cinereus*), listed as Vulnerable under the Commonwealth EPBC Act was recorded at three locations and heard calling during spotlighting activities (Figure 3).

Further discussion about this species and the likelihood for other significant species to occurring the Study Area is provided in Section 3.1.4.

As discussed previously, a number of potential habitat trees, supporting hollows, were recorded in the Study Area. A total of 88 habitat trees were recorded, mainly comprises Pink Bloodwood (*Corymbia intermedia*). This is considered a high number of habitat trees given the relatively small area of the Study Area. These habitat trees are shown on Figure 3 and described in Appendix A.

Reptiles

Habitat quality for reptiles is strongly influenced by attributes such as leaf litter, fallen logs and debris. The loss of these habitat elements very often occurs in disturbed environments and often leads to reductions in both diversity and abundance of reptiles.

Most sites assessed had a good density and coverage of leaf litter, whilst fallen timber forming hollow logs and debris was not abundant across most areas of the Study Area (Table 3). Nonetheless a moderate number of reptiles species were recorded given the relatively small Study Area and extent of disturbance created by clearing for the Peak Downs Highway.

The Open-litter Rainbow-skink (*Carlia pectoralis*) and Lace Monitor (*Varanus varius*) were most commonly recorded and most species were identified in Sites 1 and 2 (Appendix A).

3.1.4. Significant Species

Database search results for a 20 km radial area surrounding the Study Area, indicates the potential for 27 fauna species listed under the Queensland NC Act and/or Commonwealth EPBC Act to occur in the search area (Table 4). This includes 1 amphibian, 15 birds, 7 mammals and 4 reptiles which are discussed further below.

EPBC Act-listed Species

Sixteen species listed under the EPBC Act were returned from database searches for the search area. Of these, one (the Koala) was recorded in the Study Area during field surveys and four are considered to have a moderate likelihood of occurring in the Study Area due to the availability of suitable habitat (Table 4).

The four species with a moderate likelihood of occurring in the Study Area include:

- Red Goshawk (*Erythrotriorchis radiatus*) - Vulnerable
- Squatter Pigeon (*Geophaps scripta scripta*) - Vulnerable
- Northern Quoll (*Dasyurus hallucatus*) - Endangered
- Masked Owl (*Tyto novaehollandiae kimberli*) - Vulnerable.

While habitat within the Study Area is considered potentially suitable for these species, and there are known records of the Squatter Pigeon and Northern Quoll in the search area, these species would occur throughout the Eton and Connors Ranges and extensive areas of more intact habitat are available for these species. The Study Area is unlikely to support breeding habitat for any of these species due to lack of specific habitat features, such as caves and watercourses. Therefore, the Study Area would not form unique or important habitat for these species.

Koala

The Koala was identified at three locations in the Study Area. Two females and one male animal were observed in two Lemon Scented Gums (*Corymbia citriodora* var. *citriodora*)and one in a Broad-leaved Stringybark

(*Eucalyptus portuensis*). All three animals observed were within 8.12.7 (Figures 2 and 3). Calls of this species were also heard in adjacent areas during spotlighting activities during the field survey.

Based on the number of records, in a relatively small area over a short timeframe, the Koala is considered to occur in high abundance within and surrounding the Study Area. Therefore, there is potential for the Koalas that were identified in the Study Area to form part of an important population in the region. All vegetation in the Study Area is expected to provide suitable habitat for this species, except for the vine thicket community represented by RE 8.12.3. This habitat area equates to 80.7 ha in the Study Area. The Study Area is not considered particularly unique or of good quality, and therefore, it is expected that the more intact and remote areas of the Eton and Connors Ranges provide more important habitat for this species.

The existing Peak Downs Highway, is likely to cause a barrier effect to movement of the Koala either side of the highway, and there would be a risk of injury or fatality for individuals crossing the highway. However, this highway probably doesn't form a complete barrier given the persistence of this species in the Study Area.

Migratory Species

Table 5 lists the migratory species returned from the EPBC Act Protected Matters Search Tool for the search area. Of the 16 species returned from this search, one, the Spectacled Monarch (*Monarch trivirgatus*), was identified in 8.12.3 in the Study Area and another two, Black-faced Monarch (*Monarcha melanopsis*) and Rufus Fantail (*Rhipidura rififrons*), are considered to have a moderate or higher likelihood of occurring in the Study Area.

All vegetated areas within the Study Area provide potential suitable habitat for these species.

NC Act-listed Species

In addition to the 16 EPBC Act listed species identified in database search results, 11 NC Act species are considered to potentially occur in the search area, based on previous records.

Of these, five have a moderate likelihood of occurring in the Study Area (Table 4):

- Grey Goshawk (*Accipiter novaehollandiae*) – Near Threatened
- Australian Swiftlet (*Aerodramus terraereginae*) – Near Threatened
- Square-tailed Kite (*Lophoictinia isura*) – Near Threatened
- Black-chinned Honeyeater (*Melithreptus gularis*) – Near Threatened
- Ghost Bat (*Macroderma gigas*) - Vulnerable.

All of these species have been recorded in the search area and all potential forage in suitable habitat throughout the Study Area. Most of these species are more likely to overfly the Study Area, although the Ghost Bat and Black-chinned Honeyeater may forage within vegetated

habitat. However, none of these species are likely to nest or roost in the Study Area due to lack of suitable habitat features, such as caves and cliffs and watercourses.

No species listed under the NC Act were identified in the Study Area during field surveys.

3.1.5. Pests

Two exotic species were identified in the Study Area. One of these, the Wild Dog/Dingo is listed as a Class 2 declared species under the Queensland *Land Protection (Pest and Stock Route Management) Act 2002* (Appendix A).

Other declared species are likely to occur in the Study Area and broader landscape.

Table 4: Significant fauna returned from database searches for the search area

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
Amphibians						
Taudactylus eungellensis	Eungella Day Frog	E	E	DoE	Occurring in upland rainforest streams primarily within Eungella National Park, Cathu State Forest and Eungella State Forest (DEH 2005).	Low: This species is associated with wet tropical rainforest, which does not occur within the study area.
Birds						
Accipiter novaehollandiae	Grey Goshawk	NT	-	Wildlife Online	Occurs in a wide range of habitats including rainforest, gallery forest, dense or open forest, swamp forest, woodlands, plantations and mangroves but is most abundant where vegetation provides cover for hunting from perches (Marchant & Higgins 1994).	**Moderate:** Habitat in the Study Area is suitable for this species.
Aerodramus terraereginae	Australian Swiftlet	NT	-	Wildlife Online	This species flies over rainforest, cleared lands, beaches and gorges and breeds in isolated caves. It occurs in north eastern Queensland south to about Mackay (Pizzey et al. 2012).	**Moderate:** Habitat in the Study Area suitable for this species.
Calyptorhynchus lathami	Glossy Black-cockatoo	V	-	Wildlife Online	This species occurs in eucalypt woodlands with an understorey or sub-canopy of Casuarina or Allocasuarina on the seeds of which its diet is based. It nests in tree hollows (Garnett & Crowley	Low: There are few Allocasuarina trees within the Study Area.

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
					2000).	
Ephippiorhynchus asiatucus	Black-necked Stork	NT	-	Wildlife Online	The species forages mainly in open fresh waters such as flooded grassland or sedgelands, shallow swamps with abundant aquatic and short emergent vegetation and permanent pools on floodplains. It also uses freshwater meadows, wet heathland, semi-permanent swamps with tall emergent vegetation, paperbark swamps, watercourses and reservoirs (Marchant & Higgins 1994).	Low: Open wetland habitat does not occur in the Study Area.
Erythrotriorchis radiatus	Red Goshawk	E	V	DoE	The Red Goshawk is generally found in open woodland, the edges of rainforest, and in dense riverine vegetation of coastal and subcoastal forests (Marchant & Higgins 1993). This species is known to have a large home range but nest in tall trees usually within 1km of a waterway or wetland (Garnett and Crowley 2000).	**Moderate:** It is possible that the Red Goshawk could forage within the Study Area, although the lack of substantial waterways or wetlands make it unlikely to nest within the Study Area.
Geophaps scripta scripta	Squatter Pigeon	V	V	Wildlife Online, DoE	This species in known from tropical dry, open sclerophyll woodlands and sometimes savanna (Higgins and Peter 1996). It appears to favour sandy soil dissected with low gravely ridges and is less common on heavier soils with	**Moderate:** Although this species is more common west of the range it is possible that it may occur within the woodland vegetation types

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
					dense grass cover. It is nearly always found in close association with permanent water. The southern sub-species of the Squatter Pigeon is described as occurring south of the Burdekin River (Higgins and Davies 1996).	within the Study Area.
Lewinia pectoralis	Lewin's Rail	NT	-	Wildlife Online	Densely vegetated, fresh, brackish or saline wetlands, usually with areas of standing water. Favours permanent wetlands but will use ephemeral wetlands. Wetland habitat may include swamps, marshes, lakes, inundated depressions, small pools, swampy or tidal creeks and streams, saltmarshes, coastal lagoons, estuaries and farm dams with dense fringing or emergent vegetation, such as reeds, grasses and sedges. Occurs between Julatten inland to Atherton Tablelands, south to Proserpine. Also likely in south-east Queensland from Fraser Island south and inland to Toowoomba (Marchant & Higgins 1993).	Low: Wetland habitat does not occur in the Study Area.
Lophoictinia isura	Square-tailed Kite	NT	-	Wildlife Online	This species hunts primarily over open forest, woodlands and mallee vegetation types that are rich in passerines, as well as adjacent low scrubby areas and wooded towns.	**Moderate:** This species could potentially occur within the Study Area.

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
					It appears to prefer a structurally diverse landscape (Garnett & Crowley 2000).	
Melithreptus gularis	Black-chinned Honeyeater	NT	-	Wildlife Online	This species occurs in the dry eucalypt woodlands with an annual rainfall of 400 - 700mm usually on the inland slopes of the Great Divide but extending to the coast between Brisbane and Rockhampton. It appears to favour vegetation associations with box and ironbark (Garnett and Crowley 2000).	**Moderate:** This species could potentially occur within the woodland vegetation types within the Study Area.
Neochmia ruficauda ruficauda	Star Finch	E	E	DoE	The Star finch usually inhabits low dense damp grasslands bordering wetlands and waterways and also open savannah woodlands near water or subject to inundation (Higgins et. al. 2006). Absent from expanses of open county and uplands, usually occurring in valleys (Higgins et. al. 2006). In Queensland this species' range has largely contracted to the southern Cape York. There have not been any confirmed records from the Cairns to Townsville region for some time and none were recorded during the Birds Australia Atlas project (Higgins et. al. 2006). Recent records around Rockhampton are thought likely to	Low: This species is usually found in valleys and the Study Area lacks suitable habitat.

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
					be aviary escapees (Higgins et. al. 2006).	
Nettapus coromandelianus	Cotton Pygmy-goose	NT	-	Wildlife Online	This species is found on freshwater lakes, swamps and large water impoundments (Garnett and Crowley 2000).	Low: Suitable habitat not present within study area
Poephila cincta cincta	Black-throated Finch	E	E	DoE	This species is known from dry, open grassy woodlands and forests and grasslands of the sub-tropics and tropics with seeding grasses and ready access to water (Higgins et al 2006). Also thought to probably require a mosaic of different habitat in the wet season to find seed (Mitchell 1996 in Garnett and Crowley 2000). Mainly inhabit dry open to very open eucalypt woodlands with dense grassy ground cover and often along watercourses (Higgins et. al. 2006). This species has undergone a significant range contraction from the southern parts of its former distribution. It has not been recorded in south-east Queensland since the early 80s and is now thought to be extinct in NSW(Higgins et al. 2006). It is noted as being mostly absent from the coastal plain but occasionally recorded from the area around Townsville and Ingham (Higgins et	Low: The Study Area is represented by wet sclerophyll mid-dense to dense forests, which are unsuitable for this species.

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
					al. 2006).	
Rostratula australis	Australian Painted Snipe	V	E	Wildlife Online, DoE	This species occurs in shallow, vegetated temporary or infrequently filled wetlands, sometimes with trees or shrubs where it feeds at the water's edge on seeds and invertebrates (Garnett and Crowley 2000). Since 1990 there have been fewer than 100 records of this species throughout Australia (Garnett and Crowley 2000).	Low: Suitable wetland habitat is not present within the Study Area.
Tadorna radjah	Radjah Shelduck	NT	-	Wildlife Online	Tropical coast wetlands and rivers, mud-flats, salt-marsh, mangroves, paperbark swamps (Simpson & Day 1998).	Low: Suitable waterway and wetland habitat is not present within the Study Area.
Tyto novaehollandiae kimberli	Masked Owl	V	V	DoE	Forests, woodlands, caves along the entire east coast of Australia (Simpson et al. 2010).	**Moderate:** There are no known records of this species in the vicinity of the Study Area, and it is more likely to occur in more intact areas of the Eton and Connors Ranges, however, vegetation and terrain is potentially suitable.
Mammals						

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
Dasyurus hallucatus	Northern Quoll	LC	E	Wildlife Online, DoE	The Northern Quoll was once widespread in Queensland but has undergone a severe range contraction and is now absent from much of its former range. It is usually associated with dissected rocky escarpments but also known from eucalypt forest and woodlands, around human settlement and occasionally rainforest. In the Northern Territory Northern Quoll populations are becoming extinct within one year of the arrival of the Cane Toad (*Rhinella marina*) although in Queensland some remnant quoll populations persist in areas where Cane Toads have long been present (Van Dyck & Strahan 2008). The areas where the quoll persist in Queensland tend to be steep, rocky areas close to water that have not been recently burnt and appear to have become extinct in many lowland habitats formerly occupied (Woinarski et. al. 2008).	**Moderate:** It is possible that this species occurs within the broader area but is considered more likely to be associated with the steeper and less accessible areas of the Eton/Connors Range.
Macroderma gigas	Ghost Bat	V	-	Wildlife Online	The Ghost Bats roosts in shallow caves along cliff lines, boulder pile and deep limestone caves. They occur in a broad range of habitats including arid spinifex hill sides,	**Moderate:** Suitable roosting habitat potentially exists for this species close to the Study Area but

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
					grasslands, monsoon forest, savannah woodlands, tall open forest, deciduous vine forest and tropical rainforest (Churchill 2008).	not within the Study Area. Therefore, it could potentially forage but is unlikely to roost within the Study Area.
Nyctophilus timoriensis / corbeni	South-eastern Long-eared Bat	V	V	DoE	Strahan (1995) notes that the eastern long-eared bat is distributed south of the Tropic of Capricorn but uncommon and localised. This species has undergone recent taxonomic review and is now considered to be Nyctophilus species 2 (Churchill 2008).	Low: This species is generally not considered to occur as far north as Mackay and is generally found further inland.
Phascolarctos cinereus	Koala	LC	V	Wildlife Online, DoE	This species is widespread in Sclerophyll forest and woodlands on foothills and plains on both sides of the Great Dividing Range from about Chillagoe, Queensland to Mt Lofty ranges in South Australia (Menkhorst & Knight 2011).	**Present:** This species was recorded at three locations in the Study Area in RE 8.12.7. All areas of the Study Area, except RE 8.12.3 are considered to provide habitat for this species.
Pteropus poliocephalus	Grey-headed Flying-fox	LC	V	DoE	It occurs in a coastal belt from Rockhampton to Melbourne roosting in camps commonly formed in gullies, typically not far from water and usually in vegetation with dense canopy. Various habitats that include	Low: This Study Area is beyond the northern range of this species.

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
					Eucalyptus, Angophoras, tea-trees and Banksias (van Dyck & Strahan 2008).	
Rhinolophus philippinensis (large form)	Greater Large-eared Horseshoe Bat	E	E	DoE	Restricted to a broad strip of coastal and near-coastal habitat in north-eastern Queensland from Iron Range on Cape York Peninsula south to Townsville. May occur inland where suitable cave habitat exists, in Broken River, Undara, Chillagoe. May also occur south of Townsville at Mt Elliot and Cape Cleveland. Habitat includes rainforest, riparian forest, open forest and woodland. Roosts in caves and possibly tree hollows, dense foliage and large bridge culverts (van Dyck & Strahan 2008).	Low: The Study Area is outside the known distribution of this species. There have been no records of this species in the vicinity of the Study Area.
Xeromys myoides	Water Mouse	V	V	DoE	The Water Mouse inhabits saline grassland, mangroves, margins of freshwater swamps and lakes close to fore dunes in coastal Northern Territory and Queensland coast from Cooloola to Proserpine as well as Bribie and Stradbroke Islands (Menkhorst & Knight 2011).	Low: There is not suitable habitat in the Study Area and the terrain is unsuitable.
Reptiles						
Denisonia maculata	Ornamental	V	V	DoE	The Ornamental Snake is found in close association with frogs which	Low: Preferred Brigalow and gilgai

Scientific Name	Common Name	NC Reg'n [1]	EPBC Act [2]	Source [3]	Preferred habitat	Potential to occur in the study area? [4]
	Snake				form the majority of its prey. It is known to prefer woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions with clay soils but is also known from lake margins, wetlands and waterways (SEWPaC 2013a).	habitat is not present in the Study Area.
Egernia rugosa	Yakka Skink	V	V	DoE	A ground dwelling reptile found in dry open forests, woodlands and rocky areas of the Brigalow Belt. It is often found under dead timber and in deep rock crevices (Wilson, 2005).	Low: This species is usually found further inland and from drier habitats.
Eulamprus amplus	Lemon-barred Forest Skink	NT	-	Qld Museum	Confined to rainforest in the Eungella National Park, Finch Hatton, Mt Blackwood and Conway State Forest areas where it is often seen basking on rocks along waterways (Wilson 2005).	Low: Appears to be restricted to wet rainforests, which do not occur in the Study Area.
Rheodytes leukops	Fitzroy River Turtle	V	V	DoE	Known from the Fitzroy River and its tributaries (Cogger 2000).	Low: There is not suitable habitat for this species within the Study Area.

Table 5: Migratory species returned from database searches for the search area

Species	Common Name	EPBC Act Status	Preferred Habitat	Potential to occur in the Study Area
Apus pacificus	Fork-tailed Swift	Migratory & Marine: Species or species habitat likely to occur within area	Aerial over open habitat sometimes over forests and cities (Pizzey et al. 2012).	Low: Suitable habitat does not occur in the Study Area.
Hiaeetus leucogaster	White-bellied Sea-eagle	Migratory & Marine: Species or species habitat likely to occur within area	Coasts, islands, estuaries, large rivers, lakes and reservoirs (Pizzey et al. 2012).	Low: Suitable habitat does not occur in the Study Area.
Hirundapus caudacutus	White-throated Needletail	Migratory & Marine: Species or species habitat likely to occur within area	Aerial over forests, woodlands, farmlands, plains, lakes and towns (Pizzey et al. 2012).	Low: Suitable habitat does not occur in the Study Area.
Merops ornatus	Rainbow Bee-eater	Migratory & Marine: Species or species habitat may occur within area	Woodlands, beaches, rainforest and mangroves (Pizzey et al. 2012).	Low: More likely to occur in lowland areas.
Monarcha melanopsis	Black-faced Monarch	Migratory & Marine: Species or species habitat likely to occur within area	Rainforest, eucalypt woodlands and forest, coastal scrubs, rainforest gullies (Pizzey et al. 2012).	**High:** Prefers similar habitat to Spectacled Monarch, which occurs throughout the Study Area.
Monarcha trivirgatus	Spectacled Monarch	Migratory & Marine: Species or species habitat may occur within area	Rainforest, thickly wooded gullies, waterside vegetation (Pizzey et al. 2012).	**Present:** This species was identified during a bird survey in 8.12.3 in the Study Area.
Myiagra cyanoleuca	Satin Flycatcher	Migratory & Marine: Species or species habitat may occur within area	Heavily vegetated gullies in forests and taller woodlands and during migration coastal forests, woodlands,	Low: Prefers more coastal areas of habitat.

Species	Common Name	EPBC Act Status	Preferred Habitat	Potential to occur in the Study Area
			mangroves, gardens and open country (Pizzey et al. 2012).	
Rhipidura rififrons	Rufous Fantial	Migratory & Marine: Species or species habitat may occur within area	Rainforest, wet eucalypt forests, monsoon forests, paperbarks, sub-inland and coastal scrubs, mangroves, watercourses, parks (Pizzey et al. 2012).	**Moderate:** All vegetated areas within the Study Area provide potential habitat for this species.
Ardea alba	Great Egret	Migratory & Marine: Species or species habitat known to occur within area	Shallows of rivers, estuaries, tidal mudflats, freshwater wetlands, sewage ponds, larger dams (Pizzey et al. 2012).	Low: Suitable habitat does not occur in the Study Area.
Ardea ibis	Cattle Egret	Migratory & Marine: Species or species habitat likely to occur within area	Stock paddocks, pastures, croplands, garbage dumps, wetlands, tidal mudflats and drains (Pizzey et al. 2012).	Low: Suitable habitat does not occur in the Study Area.
Gallinago hardwickii	Latham's Snipe	Migratory & Marine: Species or species habitat may occur within area	Soft wet ground or shallow water with tussocks, wet paddocks, seepage below dams, irrigated areas, scrub or open woodland (Pizzey et al. 2012).	Low: Suitable habitat does not occur in the Study Area.
Hirundo rustica	Barn Swallow	Migratory: Species or species habitat may occur within area	Open forests, woodlands, grasslands, caves, ledges, offshore rocky islands, farmlands, grain stubbles, rail	Low: Is more likely to occur in open communities.

Species	Common Name	EPBC Act Status	Preferred Habitat	Potential to occur in the Study Area
			yards, towns. Occasionally roosts in old buildings. Is widespread in Australia and coastal islands (Pizzey et al. 2012).	
Rostratula benghalensis	Australian Painted Snipe	Vulnerable, Migratory & Marine: Species or species habitat may occur within area	Refer Table 4	Low: Refer Table 4.
Anseranas semipalmata	Magpie Goose	Marine: Species or species habitat may	Large seasonal wetlands and well vegetated dams with rushes and sedges, wet grasslands and floodplains (Pizzey et al. 2012).	Low: Suitable habitat does not occur in the Study Area.
Pandion haliaetus	Osprey	Marine: Species or species habitat likely to occur within area	Coasts, estuaries, bays, inlets, islands and surrounding waters, coral atolls, reefs and lagoons (Pizzey et al. 2012).	Low: Suitable habitat does not occur in the Study Area.
Crocodylus porosus	Salt-water Crocodile	Marine: Species or species habitat likely to occur within area	Occurs in coastal waters, estuaries, freshwater sections of lakes, inland swamps and marshes in all coastal areas north of Rockhampton, west to King Sound (near Broome) in Western Australia (DoE 2013a).	Low: Suitable estuarine habitat does not occur in the Study Area.

3.2. Vegetation

On-ground vegetation mapping was undertaken for the new expanded Study Area and is shown in Figure 2. Twenty-one vegetation assessment sites were performed as part of this mapping.

No new REs were identified to that mapped as part of the previous 2011 vegetation assessment undertaken by Ecological Survey & Management (reference 11027 Ltr01a). All vegetation is listed as Least Concern under the Queensland *Vegetation Management Act 1999*.

None of the vegetation assemblages identified in the Study Area are listed as Threatened Ecological Communities under the Commonwealth EPBC Act.

3.2.1. Significant Species

New locations of the NC Act listed Near Threatened Rough Malletwood (*Rhodamnia pauciovulata*) were identified, in addition to those recorded as part of the 2011 vegetation assessment undertaken for the Project. Approximately 18 individuals have now been identified in the Study Area. One additional NC Act-listed plant was recorded in the Study Area, Veiny Whitewood (*Atalaya rigida*) is listed as Near Threatened, and was recorded in RE 8.12.3 in the same location as the Rough Malletwood population. A full list of species recorded in the Study Area according to RE type is provided in Appendix B.

4. Impacts and Recommendations

4.1. Habitat Disturbance and Fragmentation

Up to 86 ha of potential habitat, in the form of remnant Least Concern vegetation may be removed within the Study Area. This will result in a reduction of the overall carrying capacity of the local area.

This disturbance has the potential to exacerbate barrier effects currently created by the Peak Downs Highway as a wider road corridor will be established. However, increased or new fragmentation is unlikely as impacts will largely involve expanding the existing cleared area, which have already fragmented habitat either side of the highway. No habitat areas will be isolated from other habitat areas as a result of vegetation clearing.

General habitat features, such as native feed trees, ground and hollow habitat are likely to be lost to some extent, however, no outstanding or unique habitat features will be lost as a result of the Project.

4.2. Edge Effects

Edge effects in the form of species and structure modification through increased light, wind sheer, weed invasion or changed species composition, is unlikely to be significant as a result of this Project given these effects are already acting on habitat either side of the Peak Downs Highway.

The most likely outcome will be that edge effects will be increase the depth of edge effects to some extent, although new edges are unlikely to be created for this Project. The denser vine thicket community, represented by RE 8.12.3, will be most susceptible to edge effects although the dense nature of this community will limit the depth of edge effects into intact areas.

4.3. Indirect Impacts

Noise and vibration emissions will result from vegetation clearing, some blasting may also be required in the creation of expanded carriageways and steep batters. Temporary or intermittent noise and vibration emissions will be associated with machinery and activity associated with construction of the Project.

Most fauna species exhibit a high degree of adaptability to these noise impacts. Construction noise may cause some behavioural modification by birds, potentially altering feeding activity, and sudden loud noises may also startle bird and mammal species. Consequently, depending on the magnitude of construction noise, there may be some species that will be repulsed by noise and therefore, will forego utilisation of habitat within the noise disturbance zones. This zone will likely be different for individual species and depend on the intensity and nature of the noise sources. It is not possible to quantify the proportion of the local fauna community that will be adversely affected by this issue but it is expected to be a minority of species, and repulsion of fauna is unlikely to occur over a significant

distance from the noise source. In the case of temporary noise associated with construction or clearing activities, native fauna are likely to return to affected habitat areas within a short period of the noise emissions ceasing.

Impacts on fauna from ground vibration (e.g. from blasting and the operation of some equipment) will be similar to noise disturbance. It is possible that some species would forego the utilisation of areas close to the vibration source, where the intensity of the vibration exceeds the tolerance of the species. However, again this is likely to be temporary during the construction period.

Dust deposition will be greatest during vegetation clearing activities and blasting activities and the severity will depend on local weather conditions.

Potential impacts of light spill from lighting associated with construction will also be temporary and most types of common and adaptable species identified in the Study Area during the field survey, are generally able to adapt to environmental conditions over small areas.

The indirect and temporary impacts described above can be easily managed in most cases through standard mitigation measures and attenuation devices as well as sensitive site planning, i.e. minimising blasting activities or vegetation clearing in adverse weather conditions. Overall, indirect impacts will not have significant impacts on fauna.

With regard to indirect impacts as a result of operation of the realigned Peak Downs Highway, these types of impacts in the form or noise and light area already occurring in the Study Area and the magnitude of these is unlikely to change.

4.4. Pest Plants and Animals

The Project has the capacity to result in the introduction and spread of weed species and to facilitate the establishment and expansion of existing populations of pest animals and plants. The invasion of pest plants could degrade the quality of fauna habitats further, increase pest animals such as European Rabbits and Red Foxes and result in direct predation of native fauna species. However, the Peak Downs Highway already presents this risk and many of these types of pests already occur in the Study Area.

Evidence of pest animals, particularly Wild Dog/Dingo were common along the edges of the Peak Downs Highway. This pest species has the ability to move freely and in some cases long distances throughout the landscape and/or readily colonise new areas. Other species, which weren't detected are also likely to be present, particularly given the conduit effect of the Peak Downs Highway, which is a major transport route in Queensland. Therefore, it is unlikely this Project will introduce new species, but rather attract some feral animal species for periods, for example Wild Dogs/Dingos during vegetation clearing activities.

A Pest Animal and Weed Management Plan will be developed and implemented to manage pest animals as part of the Project.

4.5. EPBC Act-listed Species

An assessment of the significance of impacts using the DoE Significant Impact Guidelines (2013) has been undertaken for the EPBC Act listed species identified in the Study Area, i.e. the Koala. This significance assessment is provided in Appendix C.

The outcome of the Koala significance assessment indicates that although the individuals identified in the Study Area potentially form part of an important population, it is unlikely a significant impact will occur to this species as a result of the Project, due to there being no important habitat in the Study Area for any EPBC Act listed species and better quality intact habitat occurs extensively throughout the Eton and Connors Ranges.

Significance assessment for other EPBC Act-listed species potentially occurring in the Study Area were considered redundant given the relatively small and disturbed nature of the large sections of the Study Area, extensive more intact habitat elsewhere in the Eton and Connors Ranges and the lack of evidence from field survey suggesting an important population of any other EPBC Act-listed species occurs in the Study Area. Also, the Study Area is unlikely to support breeding habitat for any other potentially occurring EPBC Act-listed species. Therefore, the Project would not cause a Significant impact to any other EPBC Act-listed species.

4.5.1. Migratory species

A number of migratory birds are considered to potentially occur in the Study Area as listed in Table 5. Approximately 86 ha of habitat will be cleared as part of this Project.

In accordance with the Significant impact guidelines an action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- Substantially modify, destroy or isolate an area of important habitat for a migratory species
- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or
- Seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

It is considered unlikely the Study Area provides important habitat for any migratory species as the habitat is homogenous in the surrounding landscape and would be unlikely to form important breeding habitat for any migratory species. Additionally, the Study Area already suffers from edge effects from the existing Peak Downs Highway, including weed incursion and modified habitat. For these reasons, the Study Area is unlikely to support an ecologically significant proportion of the population of a migratory species.

Therefore, the Project is considered unlikely to result in a significant impact to a migratory species.

4.6. NC Act-listed Species

Up to 86 ha of potential habitat for a number of NC Act-listed species may be impacted in the Study Area.

These impacts will mainly occur in the form of habitat clearing, temporary increased risk of predation, temporary disturbance from construction activities and increased barrier effects and increased edge effects adjacent newly cleared areas.

The type of impact in the Study Area is not new as the Peak Downs Highway has already created many of these impacts, resulting in habitat that is modified and not optimal. More intact habitat areas occur in close proximity to the Study Area and extent more than 25 km in a south-east and north-west direction throughout the Eton and broader Connors Ranges.

Overall, the Project is unlikely to disturb large areas or important habitat for NC Act-listed species.

4.7. Impact Mitigation

Very steep terrain constrains the design of the realignment, which allows little opportunity to avoid important habitat features. Nonetheless, where an opportunity is identified to avoid specific habitat trees (outlined in Appendix A and shown on Figure 3) and significant plants in the Study Area, this should be undertaken.

All of the significant plants occur in the vine thicket community in the northern portion of the Study Area, therefore, this habitat should be avoided as far as possible. Options for relocation of the Rough Malletwood and Veiny Whitewood should be investigated to maintain their presence in this area.

A number of controls on clearing methods and construction of the realigned highway is proposed in order to minimise impacts to vegetation and habitat and should be included in the construction Environmental Management Plan (EMP) as well as other specific management plans. Proposed controls are:

- Work areas in the vicinity of remnant vegetation will be clearly delineated during construction to prevent unnecessary encroachment of disturbance into adjacent remnant vegetation
- A Species Management Program will be developed that includes spotter/catcher pre-clearing inspections and monitoring
- Clearing will be undertaken sequentially and in accordance with all necessary internal, Queensland and Commonwealth Government permits and approvals. This will restrict the area of remnant vegetation to be cleared to that required for the safe construction and operation of the Project
- Clearing is limited to only that necessary for the Project
- Vegetation clearing and construction activities should be avoided during wet seasons particularly in the vicinity of drainage channels

- A weed and pest animal management plan will be developed that includes measures such as weed audits and mapping, design of an appropriate treatment control program, wash-down procedures and passive monitoring and control of pest plants
- If blasting is required, it should be undertaken in favourable climatic conditions, i.e. not during wet or windy conditions
- Dust suppression techniques are employed where necessary
- Speed limits are enforced throughout the Project area during construction
- Runoff and siltation of the drainage channel in the northern portion of the Study Area is managed to avoid downstream impacts to water quality.

4.8. Permits and Approvals

A Species Management Program (SMP) will be required for significant species identified or considered likely to occur within the Study Area as outlined in this report in accordance with the NC Act. The SMP will outline actions to be undertaken to minimise impacts on animal breeding places and will be submitted to the EHP for approval prior to the commencement of construction activities. The SMP will include prescriptions on the nature and duration of clearing, translocation surveys where relevant, as well as measures to be employed during clearing activities, such as direction of clearing, leaving habitat trees and clearing surrounding vegetation, monitoring and managing water quality of downstream watercourses. The role of the spotter/catcher will be important as part of the SMP. Pre-clearance surveys will be undertaken by the spotter/catcher as part of the SMP. Where a significant species is identified, e.g. a Koala, an exclusion zone will be established around the animal and the individual allowed to move on of its own accord.

A Clearing Permit will be required to disturb plants listed under the NC Act. This will be relevant for the Veiny Whitewood and Rough Malletwood in the Study Area. Translocation or offsets may be required as part of this permit.

4.9. Residual impacts

4.9.1. EPBC Act Environmental Offsets Policy

Up to 80.7 ha of Koala habitat will be impacted as a result of the Project. The EPBC Act Environmental Offsets Policy (Offsets Policy) (SEWPaC 2012a) relates to all protected matters under the EPBC Act, including species and communities listed under Sections 18 and 18A, which includes the Koala.

Sections 4 and 5.2 of the Offsets Policy states that offsets under the EPBC Act are only required if residual impacts are ‘significant’. ‘Significant’ impacts are defined under the Significant Impact Guidelines (DoE 2013c).

This assessment has found that significant impacts to species or communities listed under the EPBC Act as a result of the Project are unlikely as a result of the proportionally small area of habitat proposed to

be cleared compared with that surrounding the Study Area and the low potential for the Study Area to provide important habitat for an EPBC Act listed species.

4.9.2. Queensland Biodiversity Offsets Policy

The Queensland Government has previously committed, through the Six Month Action Plan – July to December 2013 to review the overarching framework for environmental offsets in Queensland in order to 'implement a single environmental offsets policy for Queensland'.

To date a new environmental offset framework or policy has not been implemented and EHP has advised that until a new policy is in place the existing framework and policies remain in effect. Therefore, the Queensland Biodiversity Offset Policy (QBOP) (DERM 2011) is the primary mechanism requiring offsets for impacts to state significant biodiversity values, as a result of state controlled road activities, in Queensland.

Based on the descriptions provided in the QBOP, the state significant flora and fauna values that will be impacted by the Project include:

- Potential habitat for the Grey Goshawk, Squatter Pigeon, Square-tailed Kite, Black-chinned Honeyeater and Ghost Bat (86 ha)
- Known habitat for the Veiny Whitewood and Rough Malletwood (5.6 ha).

First order streams shown on the Vegetation management Supporting Map are also considered state significant biodiversity values and which do occur in the northern portion of the Study Area. Offsetting of these values may be required through determination by the Department of Environment and Heritage Protection (EHP) under the QBOP. However, with the recent reforms of the *Vegetation Management Act 1999* and repeal of the Regional Vegetation Management Codes, offsetting requirements regarding watercourses may no longer be required and would require negotiation with the EHP.

5. Conclusions

Approximately 86 ha of Least Concern remnant vegetation occurs in the Study Area and all vegetation provides potential habitat for a number of state and Commonwealth listed species, including:

- Northern Quoll – Endangered (EPBC Act)
- Red Goshawk – Endangered (NC Act); Vulnerable (EPBC Act)
- Squatter Pigeon – Vulnerable (NC Act and EPBC Act)
- Masked Owl – Vulnerable (NC Act and EPBC Act)
- Ghost Bat – Vulnerable (NC Act)
- Grey Goshawk – Near Threatened (NC Act)
- Australian Swiftlet – Near Threatened (NC Act)
- Black-chinned Honeyeater – Near Threatened (NC Act).

One EPBC Act listed Vulnerable species, the Koala, was identified in the Study Area and the population that occurs in this location is likely to form part of an important population as defined under the Significant Impact Guidelines, due to the abundance of individuals recorded in the Study Area. Approximately 80.7 ha of habitat for this species occurs in the Study Area.

One migratory, the Spectacled Monarch, was recorded in the Study Area and another two species are considered to have a moderate or higher likelihood of occurring in the Study Area. All vegetated areas of the Study Area, 86 ha, provides suitable habitat for these species.

Up to 86 ha of clearing may occur for the Project, however, this is unlikely to cause a significant impact to state or Commonwealth listed species, due to the extensive and more intact habitat available throughout the Eton and Connors Ranges and the relatively small area of habitat to be disturbed.

A number of measures have been recommended to minimise impacts to significant species, including retaining the identified habitat trees where possible, translocating significant plants and minimising vegetation clearing as far as possible.

A Species Management Plan for NC Act-listed fauna and a Clearing Permit for NC Act-listed flora is likely to be required for the Project. Offsets for these values may be required under the QBOP.

6. References

Bennett, A.F., Resources, I.U. for C. of N. and N. & Programme, I.F.C., 1999. *Linkages in the Landscape: The Role of Corridors and Connectivity in Wildlife Conservation*, International Union for the Conservation of Nature, Gland, Switzerland.

DERM, 2011. *Queensland Biodiversity Offset Policy (version 1)*, Department of Environment and Resource Management, Queensland Government, Brisbane.

DoE, 2013a. *Crocodylus porosus - Salt-water Crocodile, Estuarine Crocodile SPRAT Profile*, Department of the Environment, Australian Government, Canberra. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1774.

DoE, 2013b. *Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) SPRAT Profile*, Department of the Environment, Australian Government, Canberra.

DoE, 2013c. *Significant Impact Guidelines 1.1: Matters of National Environmental Significance*, Department of the Environment, Australian Government, Canberra.

DSITIA, 2012. *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Version 1.0)*, Biodiversity and Ecosystem Sciences, Department of Science, Information Technology, Innovation and the Arts, Queensland Government, Brisbane. Available at: http://www.ehp.qld.gov.au/ecosystems/biodiversity/pdf/fauna_survey_guidelines.pdf.

Van Dyck, S. & Strahan, R., 2008. *The Mammals of Australia*, New Holland Publishers, Sydney.

EHP, 2013. *Wildlife Online Database Search*, Department of Environment and Heritage Protection, Queensland Government, Brisbane. Available at: http://www.ehp.qld.gov.au/wildlife/wildlife-online/.

Endler, J.A., 1977. *Geographical Variation, Speciation, and Clines*, Princeton University Press, New Jersey, USA.

Eyre, T.J., Kelly, A.L. & Neldner, V.J., 2011. *Biocondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland, Assessment Manual, Version 2.1* Department.,

Ford, G., 2013. *Microbat Call Identification Report*, Balance Environmental, Brisbane.

Forman, R.T.T., 1995. Some general principles of landscape and regional ecology. *Landscape Ecology*, 10(3), pp.133–142. Available at: http://www.ege.fcen.uba.ar/materias/general/Principles of landscape %26 regional ecology.pdf.

Hanger, J. & Loader, J., 2009. *Infectious disease in koalas: Implications for conservation. In: Koala Conservation Conference.*, Friends of the Koala, Lismore.

Higgins, P.J., Peter, J.M. & Cowling, S.J., 2006. *Handbook of Australian, New Zealand and Antarctic Birds. Volume 7 Boatbill to Starlings*, Oxford University Press, Melbourne.

Marchant, S. & Higgins, P. eds., 1994. *The Handbook of Australian, New Zealand and Antarctic Birds: Volumes 1 & 2*, Oxford University Press, Melbourne.

Marchant, S. & Higgins, P.J., 1993. *Handbook of Australian, New Zealand & Antarctic Birds, Volume 2*, Oxford University Press, Melbourne.

Melzer, A. et al., 2000. Overview, critical assessment, and conservation implications of koala distribution and abundance. *Conservation Biology*, (14), pp.619–628.

Menkhorst, P. & Knight, F., 2011. *Field Guide to Mammals of Australia*, Oxford University Press, Melbourne.

National Water Commission, 2013. *National Atlas of Groundwater Dependent Ecosystems*, Bureau of Meteorology, Commonwealth Government, Canberra. Available at: http://www.bom.gov.au/water/groundwater/gde/index.shtml.

NRM, 2013a. *Vegetation Management - Essential Habitat Map (Version 4.0)*, Department of Natural Resources and Mines, Queensland Government, Brisbane.

NRM, 2013b. *Vegetation Management Regional Ecosystem and Remnant Map (Version 8.0)*, Department of Natural Resources and Mines, Queensland Government, Brisbane.

Pizzey, G., Knight, F. & Pizzey, S., 2012. *The Field Guide to the Birds of Australia*, HarperCollins Publishers, Sydney.

Queensland Herbarium, 2013. *Regional Ecosystem Description Database (REDD). Version 8.0 (November 2013)*, Department of Science, Information Technology, Innovation and the Arts, Queensland Government, Brisbane.

Queensland Museum, 2013. Zoology Data Search. Available at: http://www.qm.qld.gov.au/Research/Biodiversity/Studying+biodiversity/Zoology+Data+Search.

SEWPaC, 2013a. *Denisonia maculata - Ornamental Snake in Species Profile and Threats Database*, Department of Sustainability, Environment, Water, Population and Communities, Commonwealth Government, Canberra. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1193.

SEWPaC, 2012a. *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy (October 2012)*, Department of Sustainability, Environment, Water, Population and Communities, Commonwealth Government, Canberra. Available at: http://www.environment.gov.au/epbc/publications/pubs/offsets-policy.pdf.

SEWPaC, 2013b. *EPBC Act Protected Matters Search Report*, Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available at: http://www.environment.gov.au/epbc/pmst/index.html.

SEWPaC, 2012b. *Interim koala referral advice for proponents*, Department of Sustainability, Envirnoment, Water, Population and Communities, Commonwealth Government, Canberra. Available at: http://www.environment.gov.au/epbc/publications/pubs/bio240-0612-interim-koala-referral-advice.pdf.

Simpson, K., Trusler, P. & Day, N., 2010. *Field Guide to the Birds of Australia*, Penguin Group Australia, Melbourne.

FIGURES