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Shute Harbour Marina Development

SHUTE HARBOUR MARINA DEVELOPMENT EIS, TERRESTRIAL ECOLOGICAL ASSESSMENT

Prepared by
Place Design Group

for
Shute Harbour Marina Development Pty Ltd

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ACKNOWLEDGEMENTS

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GLOSSARY, ACRONYMS & ABBREVIATIONS

Term	Definition
Anabat	Microchiropteran (insectivorous microbat) call detection device that detects ultra sonic bat calls, and converts them to a frequency that allows the characteristic calls of each species to be identified
Anthropogenic	Human mediated activity
Biodiversity	The variety of all life forms, the genes they contain and the ecosystems and ecological processes they are part of
Bioregion	Broad landscape patterns that reflect major structural geologies and climate as well as major changes in floristic and faunistic assemblages
CAMBA	China – Australia Migratory Bird Agreement
CG	Co-ordinator General (Queensland)
Connectivity	A behaviourally determined, species specific parameter, which depends on both landscape composition and movement ability and of animals; a parameter that measures the processes by which sub-populations in a landscape are interconnected
Contiguous	Proximally close
C'wlth	Commonwealth
DEWR	Department of Environment and Water Resources (Commonwealth)
DPI&F	Department of Primary Industries & Fisheries
Ecological Corridor	Retained and or restored systems of linear habitat, which at a minimum enhance the connectivity of wildlife populations and may help them overcome the main consequences of habitat fragmentation (Wilson & Lindenmeyer 1995); A defined area of contiguous habitat that facilitates the dispersal of subpopulations throughout the landscape. Corridors may be structural, being identifiable physical/spatial features of habitat, and functional being a measure of whether a species can move between habitat patches (Bennett 1990).
EPA	(Queensland) Environmental Protection Agency
EPBC Act	Environment Protection and Biodiversity Conservation Act (C'wlth) 1999
Exotic	An introduced species, especially one that is not of Australian origin
Extant vegetation	Still existing (remnant) vegetation
Exclusion fencing	Fencing which excludes the movement of most, terrestrially mobile species (principally larger fauna groups) and often used to prevent the movement of animals onto a roadway; often used to direct fauna (guide fencing) to an overpass/underpass structure to improve their efficacy
Feral	Wild exotic animal, usually a domesticated animal/animal species that has reverted to its wild form
Flora	The plants of a particular region, habitat, or geological period (pl. floras or florae)
Forest	Vegetation community consisting of trees to 30 m tall generally with an understorey of smaller trees, shrubs, grasses and herbs. Open-forest has a 30 - 70% canopy cover, while closed-forest has a canopy cover of >70%.

	Tall forests are forests in which the upper stratum height exceeds 30 m.
Fragmentation	The division of natural areas by vegetation clearance for human land use, isolating the remnants and the species within them and limiting genetic flow
GIS	Geographic Information System; a computer information technology which stores, analyses and graphically displays geographic data
GPS	Global Positioning System; a portable or handheld receiver unit that receives signals from the orbiting satellites that allows the GPS unit to triangulate the data to determine the units exact location (typically in latitude and longitude), elevation, speed, and time of recording
Differential GPS	A method of correcting for electronics errors and other natural accuracy-degrading effects. In its simplest a GPS base station is set up at a precisely known location. The base station receiver calculates its position based on satellite signals and compares this location to the known location. The difference is applied to the GPS data recorded by the roving GPS receiver to give a corrected (and more accurate) reading
Hair Tube	A trap designed to capture samples of mammalian hair on a sticky card by luring animals to a concealed bait without detrimentally affecting the animal. The samples obtained can be subsequently analysed to determine the species of mammal
Halophyte	Saline tolerant plant
HAT	Highest Astronomical Tide; the highest landward extent of tidal flooding in normal conditions
Herpetile	Reptiles and amphibians
Home range	The area normally utilised by an individual animal, but usually not the total range of an individual; may overlap with the home range of other individuals
Intertidal Area	Large flat subject to frequent inundation by water that is usually salty or brackish, aggraded by tides.
Invertebrate	Animal species lacking a backbone
JAMBA	Japan – Australia Migratory Bird Agreement
Microchiropteran (bat)	Group of small insectivorous bats emitting high frequency calls that enable them to find prey and avoid obstacles
MNES	Matter of National Environmental Significance
NC Act	Nature Conservation Act (Qld) 1992
NC(W) Regulation	Nature Conservation (Wildlife) Regulation 2006
NRW	Department of Natural Resources and Water (Qld)
Pelagic	Open oceanic waters (away from land)
Qld	Queensland
RE	Regional Ecosystem; REs describe the relationship between vegetation communities in a particular bioregion that are consistently associated with a particular combination of geology, landform and soil
Remnant Vegetation	1. Any patch of native vegetation or habitat around which most, or all, the original vegetation is removed 2. Vegetation as defined under the *Vegetation Management Act* being native woody vegetation:

	▪ With 50% or greater of the predominant canopy cover that would exist if the vegetation community were undisturbed; and ▪ With 70% or greater of the height of the predominant canopy that would exist if the vegetation community were undisturbed; and ▪ composed of the same floristic species that would exist if the vegetation community were undisturbed.
Riparian	From the Latin word for riverbank; pertaining to riverbanks; riparian vegetation refers to the vegetation along riverbanks
SDPWO Act	Queensland State Development and Public Works Organisation Act (Qld) 1971
Significant species	International migratory fauna (principally bird) species identified in the schedules of the NC Act and EPBC Act
Sub-population	A component of a larger interacting meta-population
Supra-littoral margin	Zone between terrestrial vegetation and the mangrove zone at the top of the tidal plain; in the vicinity of the Highest Astronomic Tide (HAT)
Threatened species	Species listed as critically endangered, endangered, vulnerable in the EPBC Act or endangered, vulnerable and rare in the NC Act and Regulation
VM Act	Vegetation Management Act (Qld) 1999
WSC	Whitsunday Shire Council
Wildlife	Naturally occurring plants and animals (both native and exotic)
Scat	Faecal pellet; dropping

EXECUTIVE SUMMARY

Background

Shute Harbour Marina Development Pty Ltd commissioned PLACE Environmental (PLACE) to undertake a terrestrial ecological assessment and prepare a report addressing findings for the proposed Shute Harbour Marine Project, Shute Harbour. The objective of the study was to address the requirements of the *Terms of Reference for an Environmental Impact Statement* relating to terrestrial flora and fauna issued by the Co-ordinator General, January 2007.

The Shute Harbour Marina project (the Project) was declared a "significant project" under Section 26 of the Queensland's State Development and Public Works Organisation Act 1971 (SDPWO Act) by the Coordinator-General (CG) on 24 July 2006. As such approval for the project is subject to the preparation of an Environmental Impact Statement.

The purpose of this assessment was to assess the terrestrial ecological attributes of the site (biodiversity, ecological communities and habitats, processes and integrity), determine their pest/conservation significance subject to State and Commonwealth legislation, assess the magnitude and nature of the impact of the proposed development and to identify means of ameliorating or mitigating impact. Relevant legislation considered by this assessment includes:

- ***State Legislation -*** Assess the potential impacts the proposal might have on Regional Ecosystems (Vegetation Management Act 1999 (*VM Act*) and threatened species (Nature Conservation Act 1992 (*NC Act*) and Nature Conservation (Wildlife) Regulation 2006(*NC(W) Regulation*)) and identify the presence of declared pests subject to the *Land Protection (Pest and Stockroute Management) Act 2002* and *Plant Protection Regulation 2003*.
- ***Commonwealth Legislation -*** Assess the potential impacts the proposal might have on threatened species or ecological communities, applicable to listed threatened species, communities and migratory shore birds and shore dependent marine reptiles identified under the *EPBC Act 1999*.

Vegetation and Communities

None of the species identified on the site:

- Are threatened species subject to the provisions of State or Commonwealth legislation;
- Are at the extent of their geographic range; or
- Represent an extralimital extension to a previously known geographic range.

The site is mapped as containing Essential Habitat for *Macropteranthes fitzlanii*. The vegetation assessment shows that the mandatory factors (REs) and one of the four listed habitat factors[1] for this species are absent from the terrestrial vegetation communities that lie to the north of Shute Harbour Road Reserve. The remaining three habitat factors are present. These areas will not be affected by development and will returned to public ownership.

Most of the vegetation communities of the site, with the exception of terrestrial vegetation closest to Proserpine - Shute Harbour Road and the former quarry site, are relatively undisturbed and have good ecological value and functioning. Analogous Regional Ecosystems on the site carry a vegetation management status of *Not of Concern* and a biodiversity management status of *No Concern at Present.*

None of the vegetation communities identified on the site are considered Threatened Ecological Communities under the *EPBC Act*.

[1] Vegetation community habitat factor for *Macropteranthes fizlanii*: notophyll to complex notophyll vine forest; low microphyll vine forest; ecotone between mangroves and notophyll vine forest; littoral rainforest

This table shows that approximately 2.59 hectares of woody (remnant and regrowth) vegetation would be affected, of which 1.8 hectares is 'remnant' vegetation:

- The majority of this vegetation comprises mangrove RE8.1.1 (1.65 hectares) whose removal is not assessable under the VM Act[2] but which is the subject of a separate Department of Primary Industries & Fisheries (DPI&F) application process; and
- A small area of RE8.12.5 (0.05 hectares) and 8.12.14 (0.1 hectares) that lie within Proserpine-Shute Harbour Road reserve. This would be affected by road works associated with providing site access / improving traffic safety. Such RE removal would be exempted under the vegetation management code if these works were undertaken on behalf of a (Local) Governmant Authority.

Offsets are proposed for both through revegetation of newly created habitat (mangroves) and revegetation of previously disturbed area (terrestrial vegetation to the north of Proserpine-Shute Harbour Road.

Land to the north of Proserpine - Shute Harbour Road, which contains a significant extent of remnant vegetation (as defined by the VM Act) will be returned to public ownership. Prior to dedication, previously disturbed areas will be revegetated with species endemic to adjacent terrestrial REs.

Animals and Habitat

None of the species identified on the site:

- Are threatened species subject to the provisions of State or Commonwealth legislation;
- Are at the extent of their geographic range; or
- Represent an extralimital extension to a previously known geographic range.

Development of the site will result in the removal of 0.15 hectares of woodland/open forest and 1.65 hectares of mangrove shrubland habitat from the site.

The terrestrial habitat types are well represented in the locality (extensive with adjacent Conway National Park) and regionally. All equivalent REs have a vegetation management status of *Not of Concern,* and a Biodiversity (EPA) status of *No Concern at Present,* and as such have greater than 30 % of their pre-clearing extent remaining in the Central Coast Bioregion.

The site is mapped as containing Essential Habitat for rufous owl and potentially Proserpine rock-wallaby. The vegetation assessment shows that the mandatory factors (REs) and one of the four listed habitat factors for this species are absent from the terrestrial vegetation communities that lie to the north of Shute Harbour Road. The remaining three habitat factors are present.

The majority of site impact will occur in marine plant communities represented by RE8.1.1. This RE is not mapped as essential habitat for either species. REs comprising mandatory factors for the species, may be affected but only in a very minor way. Potentially, up to 0.15 hectares of these REs occuring within the Proserpine-Shute Harbour Road Reserve may be cleared for provision of turning slots and passing lanes associated with the marina. Removal of this vegetation will not affect viable habitat corridors for these or other species.

All terrestrial habitat located to the north of Proserpine-Shute Harbour Road Reserve will be returned to public ownership.

[2] Part 2, division 1, 8c of the VM Act notes that mangroves are not 'vegetation' as defined by the act

Ecological Corridors – Terrestrial

The terrestrial components of the site forms part of a large contiguous patch of remnant open and closed forest habitat that encompasses Conway National Park. Generalised movement of animals through the site is most likely to be east – west. The presence of Proserpine-Shute Harbour Road and the intertidal plane to the south of the site is likely to exclude most movement of fauna north to south on account of an absence of suitable habitat. However some of the larger bird and bat species may fly between the site and the southern sections of Conway National Park, across Shute Harbour.

Generalised north-south movement of terrestrial animals is likely to occur through suitable forest habitat that links the southern and northern section of the park two kilometers to the west of the site. This linkage is however bisected by Proserpine – Shute Harbour Road.

North/south movement across Proserpine - Shute Harbour Road by Proserpine Rock-wallaby *Petrogale Persephone*, a species with high local prominence, and a threatened species, is unlikely within the boundaries of the marina site, as there is no suitable habitat for this species located on the southern side of the road.

Review of *The Recovery Plan for the Proserpine Rock-wallaby Petrogale persephone 2000 – 2004* (Nolan and Johnson 2001) to determine likely corridors based on identified or predicted attributes indicates that the existing Proserpine – Shute Harbour Road bisects a large area of suitable habitat for Proserpine Rock-wallabies approximately 2-4 kilometres to the west of the site.

Nolan and Johnson (2001) identify road mortalities as a significant threatening process to this species. Known crossing points for the Proserpine Rock-wallaby *Petrogale persephone* are associated with a ridge known as Flametree Hill situated between Mandalay and Shute Harbour some 4 kilometres to the west of the marina site. Flametree Hill is a known hot-spot for vehicle strike. Actions have already been undertaken jointly by Queensland Parks and Wildlife Service and Main Roads Department to reduce road kills in this area. These have included revegetation of road verges and the trial of roadside wildlife reflectors (Barry Nolan, Senior Ranger Airlie Beach Central Region – QPWS, pers. comm., 9 May 2007).

As development of the marina site has the potential to increase the volume of traffic along Proserpine - Shute Harbour Road, thus resulting in the potential for increased road mortality of Proserpine Rock-wallabies that may cross the road to the west of the site monitoring for additional impacts and or crossing points based on strike data and nocturnal survey, in conjunction with / or to an agreed QPWS methodology is necessary. Should impacts be identified, amelioration in the form of a night time reduction in speed limits, wildlife crossing signs and reflective devices (Nolan and Johnson 2001), audible rumble strips or introduction of traffic calming devices (raised traffic platforms, series of speed humps) at the approaches to identified crossing points.

Implementation of reduced speed limits may also reduce the potential for road mortalities of rufous owl *Ninox rufa queenslandica* that may occur in the wider locality. In the absence of known mortality hot-spots, the recommended strategy is reduced speed signage for sunset to sunrise, placement of reflectors at predicted crossing sites with ongoing monitoring being considered with the aforementioned traffic calming devises retrofitted if hot-spots are identified post-development.

Effects on Intertidal Fauna and Habitat

The intertidal marine vegetation community extends through the site to the west and east. Construction of the marina would disrupt longitudinal wading movement along the beach by intertidal fauna, principally waders. However as they are mobile species the imposition of a marina would not be a significant impact.

The majority of migratory wading birds are summer migrants and with the exception of over-wintering individuals of some species, most will occur in the locality of the site between August and May. It is therefore desirable to undertake the proposed works at the site between May to August if possible, to

avoid unnecessary impacts on the feeding patterns of these species. However, construction works that continue beyond August are unlikely to have any significant impacts on these species.

Although completion of the proposed marina is likely to result in the loss of a small area of potential forage and roosting habitat for a number of migratory wading birds protected under JAMBA, CAMBA and Queensland's *Nature Conservation Act 1992*, given the extent of similar shoreline habitat protected within Conway National Park and offshore islands, and the creation of intertidal habitat associated with the marina basin spoil deposition area, there are no long term, no deleterious effects on migratory wader are expected.

Lights that attract nesting turtles and hatchlings are likely to contribute to increased mortality. Excessive lighting impacts on gravid female marine turtles as they move towards rookery site to lay eggs are well known and understood. Sources of light that affect marine turtle orientation include street lights, coastal marina developments, and boats moored at sea and in harbours and marina.

For this reason shielded and directed and low lux lighting is used around rookery sites where development occurs nearby. This ameliorates the disorientating effects lighting has. All un-necessary lighting will be switched off and timers used with some forms of lighting around the development to reduce the overall cumulative effect. For the proposed development, this is not likely to be an issue as there are no known rookery sites located nearby.

Overall the proposal is unlikely to have a significant impact on terrestrial or marine fauna and habitats, either during the construction or operational phases of the project, providing all necessary and appropriate environmental management controls associated with these project phases are maintained.

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1.0 INTRODUCTION

1.1 Background

Shute Harbour Marina Development Pty Ltd commissioned PLACE Environmental (PLACE) to undertake a terrestrial ecological assessment and prepare a report addressing findings for the proposed Shute Harbour Marine Project, Shute Harbour. The objective of the study was to address the requirements of the *Terms of Reference for an Environmental Impact Statement* relating to terrestrial flora and fauna issued by the Co-ordinator General, January 2007.

1.2 Legislative Overview

The Shute Harbour Marina project (the Project) was declared a "significant project" under Section 26 of the Queensland's State Development and Public Works Organisation Act 1971 (SDPWO Act) by the Coordinator-General (CG) on 24 July 2006. As such approval for the project is subject to the preparation of an Environmental Impact Statement.

The statutory impact assessment process under the SDPWO Act is also the subject of a bilateral agreement between the Queensland and the Commonwealth Governments in relation to environmental assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*). The project was referred to the Commonwealth Minister for the Environment and Heritage in accordance with the provisions of the *EPBC Act*. The Commonwealth Minister decided, on 27 July 2006, that the project constituted a controlled action under Section 75 of the *EPBC Act*. The Part 3, Division 1, controlling provisions are:

- Sections 12 & 15A (World Heritage);
- Sections 18 & 18A (Listed Threatened Species and Communities);
- Sections 20 & 20A (Listed Migratory Species); and
- Sections 23 and 24A (Marine Environment).

The purpose of this assessment is to assess the terrestrial ecological attributes of the site (biodiversity, ecological communities and habitats, processes and integrity), determine their pest/conservation significance subject to State and Commonwealth legislation, assess the magnitude and nature of the impact of the proposed development and to identify means of ameliorating or mitigating impact. Relevant legislation considered by this assessment includes:

- ***State Legislation -*** Assess the potential impacts the proposal might have on Regional Ecosystems (Vegetation Management Act 1999 (*VM Act*) and threatened species (Nature Conservation Act 1992 (*NC Act*) and Nature Conservation (Wildlife) Regulation 2006(*NC(W) Regulation*)) and identify the presence of declared pests subject to the *Land Protection (Pest and Stockroute Management) Act 2002* and *Plant Protection Regulation 2003*.
- ***Commonwealth Legislation -*** Assess the potential impacts the proposal might have on threatened species or ecological communities, applicable to listed threatened species, communities and migratory shore birds and shore dependent marine reptiles identified under the *EPBC Act 1999*.

In doing so, this report responds to items 4.8.1.1, 4.8.1.2, 4.8.2, A4, A6 and in part 4.8.1 of the *Shute Harbour Marina Development, Terms of Reference* (State Development, January 2007).

1.3 Study Team

All staff undertaking this assessment have extensive experience in the design and implementation of ecological assessments, the synthesis and analysis of data collected and assessment of impacts associated with residential, commercial, industrial and recreational facilities. Curricula vitae of the study team are presented as **Appendix A**.

2.0 PROPOSED DEVELOPMENT SITE

2.1 Location

The site is located within Shute Bay part of the Whitsunday Shire Council local government area. The site is located at Proserpine - Shute Harbour Road, Shute Harbour (**Figure 1**) and is described as Lot 2 on Plan SP 117389, Lot 273 on Plan HR1757 and portion of Proserpine - Shute Harbour Road abutting the north-west corner of Lot 2 north of Proserpine - Shute Harbour Road.

The site lies within the boundary of the (state) Great Barrier Reef Coast Marine Park (GBRCMP) but outside the boundary of the (Commonwealth) Great Barrier Reef Marine Park (GBRMP), Dugong Protection Areas and Fish Habitat Areas (FHA). Part of the site encroaches on the edge of the Wet Tropics World Heritage Area. The site abuts the state declared Conway National Park which lies to the north of the site.

2.2 Project Overview

The proposed master plan (**Figure 2**) for development of the 41.1 hectare site incorporates the following land uses:

- Marina and associated infrastructure such as wave attenuator, pontoons, chandlery, fuelling and sullage pump out facilities;
- Commercial Precinct comprising a Resort Hotel of up to 109 units, and associated facilities such as reception, lounge, bars, function rooms, restaurant, kitchen, offices, retail, Charter Base and Car parking;
- Managed Resort Accomodation Precinct comprising allotments for development of single dwellings; and
- Landscaped roads, pathways and urban design elements.

2.3 Land Use and Site History

The site straddles Proserpine - Shute Harbour Road. The area to the north of the road retains remnant eucalypt open forest vegetation, while to the south, the site contains intertidal and marine habitats (principally mangrove shrubland to low closed forest).

The site comprises two properties of variable size and differing land use. The property specifically described as Lot 2 on SP117389 represents the southern toe and associated flats of Mt Rooper and a portion of Shute Harbour and comprises 29.2 hectares. Lot 273 on HR1757 is 0.134 hectares in area and encompasses an abandoned small quarry and residential parcel within the eastern extent of the site. The site is approximately 550m from the Shute Harbour concourse.

Establishment of Proserpine - Shute Harbour Road (through the site) was achieved by the deposition of fill into lower lying parts of the site. These lower lying areas principally consist of several steep drainage lines that drain more elevated terrain to the north (Conway National Park) and supra-littoral margin. The presence of exposed fill has facilitated the establishment of a variety of weeds, and facilitated a changed flora within the drainage lines upstream of the road.

With the exception of gazetted road and powerline reserves, the site is unused for any authorised anthropogenic activity. Subtidal (marine) parts of the site are occasionally used for informal, mooring of vessels.

500 0 500 1000m approx.

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SHUTE HARBOUR
SUBJECT SITE

DATE: 09/07/2008
FIGURE NO: 01
DWG NO./ISSUE: SHU01_01/C
SCALE: AS INDICATED

N

Development layout as per 'Masterplan', Dwg No. 0605 Sk01, Issue SD 18, STUDIO TEKTON, 05/06/2008.

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SHUTE HARBOUR
PROPOSED DEVELOPMENT

DATE: 03/07/2008
FIGURE NO: 02
DWG NO./ISSUE: SHU01_ECO_02/B
SCALE: NTS

3.0 FLORA

3.1 Scope

The primary aims of the flora survey were to:

- Identify the flora species and vegetation communities that are currently present or are likely to be present in the proposed marina development site;
- With respect to vegetation communities present, determine whether the communities could be considered 'remnant' woody vegetation with respect to the provisions of the *Vegetation Management Act 1999* (*VM Act*);
- Determine the conservation status of these species and vegetation communities in relation to State *NC Act* and Commonwealth *EPBC Act* legislation;
- Determine how construction and operation of the marina may directly and indirectly affect on-site and off-site flora species and communities; and
- Outline measures to mitigate development effects.

3.2 Desktop Review

3.2.1 Regional Ecosystem Mapping

Prior to undertaking the field survey component of the Flora assessment, identification of the currently mapped Regional Ecosystems (RE's) for the site was carried out to; identify the range of vegetation communities that potentially occur on the site, their current conservation status and to characterize species potentially present.

The Queensland *VM Act* was proclaimed on 15 September 2000. As part of the process of developing a statewide system for the management of native vegetation on freehold and leasehold land for the *VM Act*, the concept of a Regional Ecosystem was developed.

A Regional Ecosystem is defined as a vegetation community, within a bioregion, that is consistently associated with a particular combination of geology, landform and soil (Sattler and Williams 1999). The conservation status for each RE is assigned one of three categories; 'Endangered', 'Of Concern' and 'Not of Concern'[3] according to its current distribution relative to its pre-clearing distribution. An up to date conservation status for each RE in Queensland is listed in the Regional Ecosystem Description Database (REDD) (EPA 2005).

All remnant vegetation in Queensland must be assigned to a RE from the REDD (EPA 2005). Pre-clearing vegetation is defined by the Queensland Herbarium as vegetation present before clearing (Neldner *et al* 2004). The definition of remnant vegetation follows that used by the Queensland Herbarium, which is stated in the *VM Act* as woody vegetation where the dominant canopy has greater than 70% of the pre-clearing/thinning height, and greater than 50% of the cover relative to the undisturbed[4] height and cover of

[3] **Regional Ecosystem** (RE) prescribed under a regulation in the *Vegetation Management Act 1999:*

- '*Not of Concern*' RE has greater than 30% of its pre-clearing extent across the state remaining and there is little or no degradation;
- '*Of Concern*' RE has either 10-30% of its pre-clearing extent across the state remaining or more than 30% of its pre-clearing state remaining and the remnant vegetation remaining is less than 10,000 hectares but not subject to threatening processes;
- '*Endangered*' RE has less than 10% of pre-European extent remaining in an intact condition in that bioregion and the area remaining is less than 10,000 hectares and subject to threatening processes.

that stratum and is dominated by species characteristic of the vegetations undisturbed canopy. All other vegetation (other than natural grasslands) is considered non-remnant and has no management status under the *VM Act*.

The proposed development site is located in the Whitsunday Sub Region of the Central Queensland Coast Bioregion[5]. Environmental Protection Agency Regional Ecosystem Mapping[6] accessed 15 February 2007 (**Figure 3**) indicates that the site is currently listed as Regional Ecosystem (RE) 8.12.5/8.12.14 in an approximate distribution 70%/30%, and a littoral fringe of 8.1.1 (Table 3.1).

Table 3.1: Regional Ecosystems of the Site as identified by RE Mapping

RE	Description	Vegetation Management Status	Biodiversity Status	Significant Flora
8.1.1	Open-shrubland to closed forest of mangrove species forming a variety of associations, depending on their position in relation to tidal channels and the amount of freshwater input they receive on marine clay plains and estuaries	Not of Concern	No Concern at Present	None listed
8.12.5	Pink bloodwood *Corymbia intermedia*, Shute Harbour white mahogany*E. portuensis* ± brush box Lophostemon spp. ± turpentine *Syncarpia glomulifera* ± coast banksia *Banksia integrifolia*, open forest on Mesozoic to Proterozoic igneous rocks	Not of Concern	No Concern at Present	Habitat for the threatened species *Ozothamnus eriocephalus*
8.12.14	Variable eucalypt dominated associations, often with grey ironbark *Eucalyptus drepanophylla*, narrow leaved ironbark *E. crebra*, *Acacia spirorbis* subsp. *solandri*, brush box *Lophostemon confertus* and Queensland peppermint *E. exserta*, on islands and rocky headlands, on Mesozoic to Proterozoic igneous rocks, and Tertiary acid	Not of Concern	No Concern at Present	Habitat for the threatened species *Berrya rotundifolia* and *Bonamia dietrichiana*

Source: REDD[7]

Regional Ecosystem mapping is based on remote sensing of historic and current aerial photography, satellite images and occasionally is supplemented by field data sourced by the Queensland Herbarium. Owing to the broadscale coverage of this mapping, many areas are not field-truthed, and instead remnant status and canopy cover (viz. REs) are derived from desk-top analysis of data sets. Therefore the vegetation association component of mapping can occasionally be incorrect.

Other sources of error may arise from the scale of the mapping. Land zones[8] (a major determinant of RE type) are generally derived by amalgamating broadscale geology, land system and/or soil mapping of between 1:100,000 and 1:250,000 scale. Land zones represent major differences in geology and in the associated landforms, soils, and physical processes that gave rise to distinctive landforms or continue to shape them (Sattler and Williams 1999). This derives 'landscape' patterns of land zone boundaries that are 'coarse'. Site specific surveys allow a finer resolution at a local or site scale.

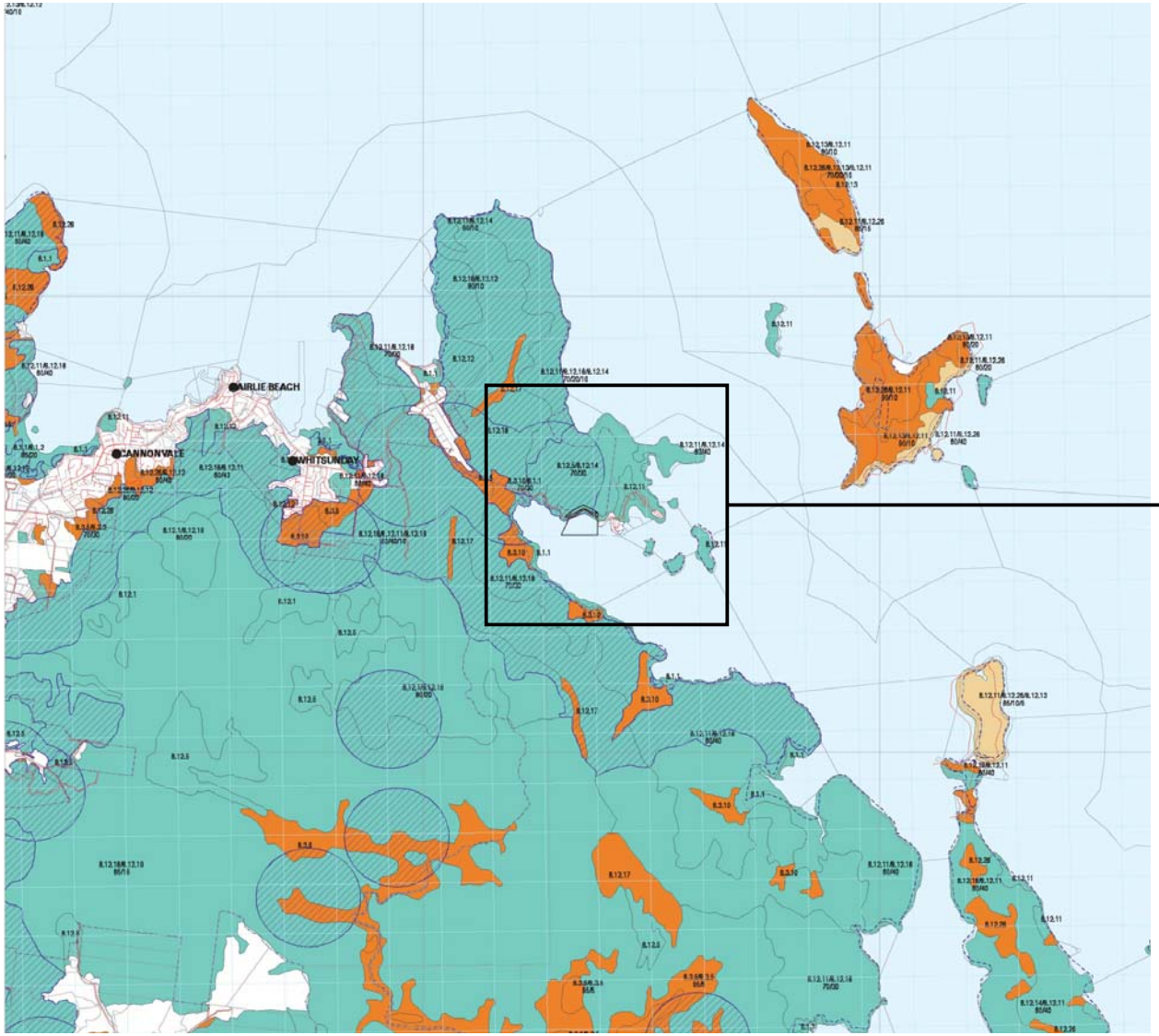
[4] An undisturbed stratum or layer is defined as one that shows no evidence of extensive gross mechanical or chemical disturbance (logging, clearing, poisoning etc.) evident in field inspections or historical aerial photography (Neldner, Wilson, Thompson & Dillewaard 2004;26).

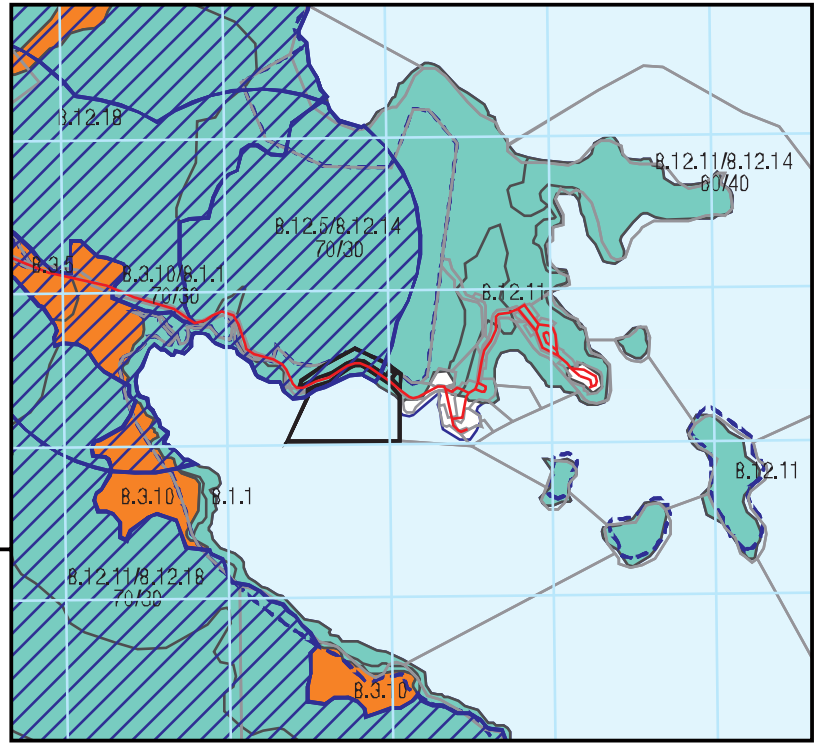
[5] **Bioregions** are divided into a number of sub-regions on the basis of delineation of different landscape patterns that are usually associated with geology and geomorphology. This leads to a characteristic pattern of landform and vegetation (Sattler & Williams 1999).

[6] Version 5.0 accessed 15 February 2007

[7] http://www.epa.qld.gov.au/projects/redd/index.cgi

[8] **Land Zones** - represent the significant differences in geology and in the associated landforms, soils and physical processes that continue to shape them (Sattler & Williams 1999). Land Zones correspond to broad geological/geomorphological categories of which 12 are recognized through the state.





2003 Remnant endangered regional ecosystem
Dominant
Sub-dominant
2003 Remnant of concern regional ecosystem
Dominant
Sub-dominant
2003 Remnant not of concern regional ecosystem
Non-remnant
Plantation Forest
Dam or Reservoir
2003 Remnant Vegetation Cover (RVC)
Vegetation Management Act Essential Habitat
Area identified as essential habitat by the EPA for a species of wildlife listed as endangered, vulnerable, near threatened or rare under the *Nature Conservation Act 1992*.
For further information on VMA Essential Habitat, please see the attached VMA Essential Habitat map.
Subject Lot
Certified Map Amendment area
Roads
© MapInfo Australia Pty Ltd 2006
Bioregion boundary
National Park, Conservation Area State Forest and other reserves
Cadastre line
The maximum spatial error of parcels extracted for this map from the Digital Cadastral Data Base(DCDB) range from: 14m to 251m at a 95% confidence level. Property boundaries shown are provided as a locational aid only.
Towns

N

1 0 1 2km approx.

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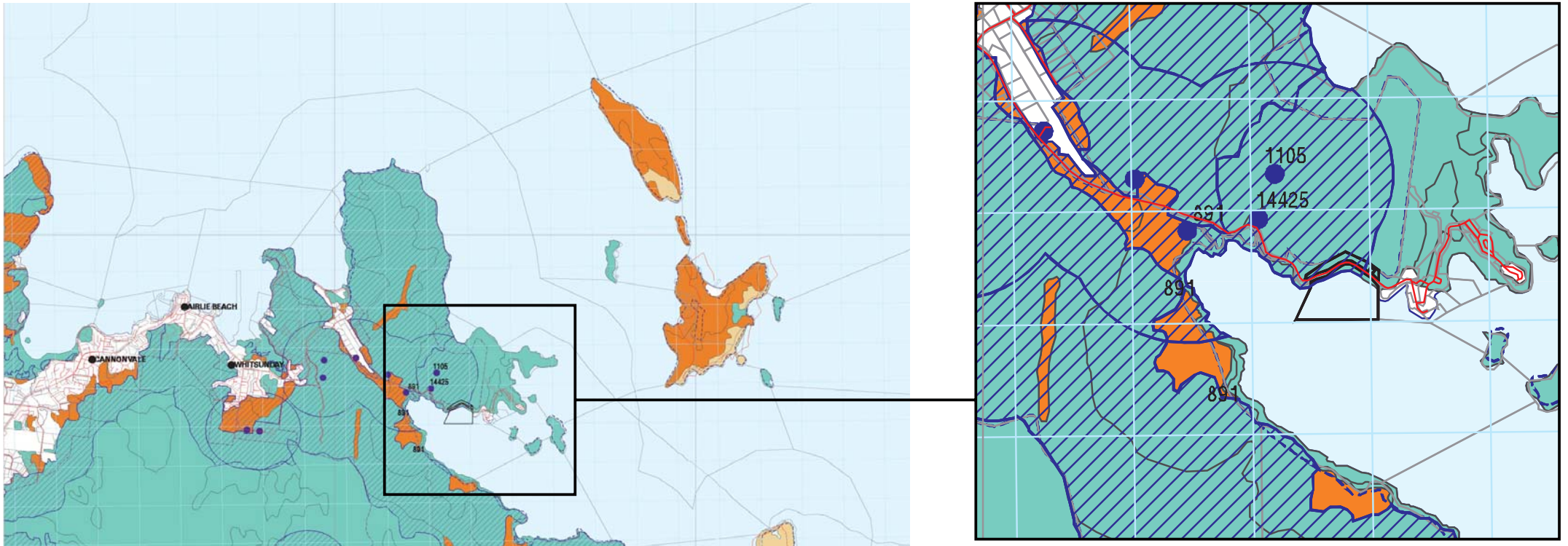
SHUTE HARBOUR REGIONAL ECOSYSTEM MAPPING

FIGURE 3A
DATE: 08/05/2007
DWG NO./ISSUE: SHU01_ECO_3A/A
SCALE: AS INDICATED



14425 - *Macropleranthes fitzalanii*

891 - Proserpine Rock Wallaby *Petrogale persephone*

1105 - Rufous Owl *Ninox rufa queenslandica*

1 0 1 2km approx.

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SHUTE HARBOUR

ESSENTIAL HABITAT MAPPING

FIGURE 3B
DATE: 04/05/2007
DWG NO./ISSUE: SHU01_ECO_3B/A
SCALE: AS INDICATED

Owing to these potential differences in the mapping, the Department of Natural Resources and Water (NRW) as administrators of the *VM Act* and the Environmental Protection Agency (EPA) as the organisation responsible for RE Map compilation, therefore recommend site based surveys where woody vegetation is present to determine firstly the vegetation's 'remnant' status and secondly, its correct equivalent RE.

3.2.2 Database Searches

In order to assist in the identification of the range of species which given suitable habitat and seasonal conditions, could utilise habitat types on the site, and to identify the suite of state and nationally threatened species which might be present on the site if suitable habitat was present, the databases of the EPA (WildNet online) and DEWR (Protected Matters Search Tool) were searched.

Records were obtained from a 5 kilometre buffer around a point located in the centre of the study site (coordinates: Latitude: - 20.2886, Longitude 148.7786). Results of the WildNet On-line[9] (Qld) search are provided in **Appendix B.1** and results of the Protected Matters Database Search[10] (C'wlth) are outlined in **Appendix B.2**.

The search area covers an area much larger than the study site to maximise identification of regional flora species with the potential to occur on site. The presence of particular species in these results however does not imply that those species will definitely be found on the study site.

268 flora species were identified by the databases consulted. Of those species, four (4) are listed under Queensland's *NC(W) Regulation* (**Table 3.2**) and two (2) are listed under the Commonwealth *EPBC Act* (**Table 3.3**). Three additional threatened species identified from the review of mapped REs are outlined at **Table 3.4**.

Table 3.2: Threatened Plant Species Identified from Results of Wildlife Online Search

Species	Common Name	Conservation Status		Habitat/Notes
		NC Act	EPBC Act	
Atalaya rigida	No common name	R	-	Shrub or small tree; semi-evergreen vine-thicket and araucarian notophyll vine forest, often on red soil or scree slopes; no suitable habitat
Macropteranthes fitzalani	northern bonewood	R	-	Tree; semi-evergreen vine-thicket and araucarian notophyll vine forest, often on red soil or scree slopes; no suitable habitat present on site
Rourea brachyandra	No common name	R	-	Liana; rainforest; no suitable habitat present on site
Solanum sporadotrichum	No common name	R	-	Shrub; Semi-deciduous notophyll/mesophyll vine forest fringing watercourses; no suitable habitat present on site

Conservation Status: *Nature Conservation Act (Qld) 1992 (NC Act)* - endangered (E), vulnerable (V), rare (R); *Environment Protection and Biodiversity Conservation Act (C'wlth) 1999 (EPBC)* – endangered (E), vulnerable (V)

[9] http://www.epa.qld.gov.au/nature_conservation/wildlife/wildlife_online (accessed 15/02/2006)

[10] http://www.deh.gov.au/erin/ert/epbc/index.html (accessed 15/02/2007)

Table 3.3: Threatened Plant Species Identified from Protected Matters Database

Species	Common Name	Type of Presence	Conservation Status		Habitat/Notes
			NC Act	EPBC Act	
Leucopogon cuspidatus	No common name	Species or species habitat likely to occur within area	-	V	Shrub; grows in shrubby woodlands on hills and mountains from Hinchinbrook Island to Rockhampton on granite; possible; not recorded locally
Ozothamnus eriocephalus	No common name	Species or species habitat likely to occur within area	V	V	Shrub; restricted to central coast from the Bowen and Mackay districts. Known from Mt Abbot, Gloucester I., Lake Elphinstone area, Clarke Range and near Sydney Heads. Known from a range of habitat types, including margins of disturbed vine forest / gallery forest / open forest / rocky ridges / creek banks and steep granite slopes; not recorded locally

Conservation Status: *Nature Conservation Act (Qld) 1992 (NC Act)* - endangered (E), vulnerable (V), rare (R); *Environment Protection and Biodiversity Conservation Act (C'wlth) 1999 (EPBC)* – endangered (E), vulnerable (V)

Table 3.4: Threatened Plant Species Identified from REDD for Mapped REs

Species	Common Name	Conservation Status		Habitat/Notes
		NC Act	EPBC Act	
Berrya rotundifolia	No common name	R	-	Small tree: Variable eucalypt open forest (RE8.12.14); **not recorded locally**, specimens found on Whitsunday Islands
Bonamia dietrichiana	No common name	R	-	Liana/scrambler: Variable eucalypt open forest (RE8.12.14) and notophyll/microphyll rainforest on Mesozoic to Proterozoic igneous rocks (RE8.12.3)
Ozothamnus eriocephalus	No common name	V	V	Shrub of Mixed eucalypt open forest (RE8.12.5)

Conservation Status: *Nature Conservation Act (Qld) 1992 (NC Act)* - endangered (E), vulnerable (V), rare (R); *Environment Protection and Biodiversity Conservation Act (C'wlth) 1999 (EPBC)* – endangered (E), vulnerable (V)

3.2.3 Essential Habitat

The site is mapped as containing essential habitat for *Macropteranthes fitzalanii* (**Figure 3b**) a shrub or small tree which grows to 7 metres in height. Habitat for the species includes a variety of dry vine forest and moist rainforest types occuring on alluvium and steep hillslopes. Essential habitat notes indicate that REs 8.3.10, 8.12.3, 8.12.11 and 8.12.18 are key habitats for this species. None of these REs are present on the site.

3.3 Field Survey

Details of the Vegetation survey methodology are outlined in **Appendix C**. A complete inventory of all flora identified, and approximate distribution within the investigation area is provided in **Appendix D**. Vegetation associations (including areas of marine vegetation) were mapped using differential GPS technology and plotted to the site plan (**Figure 4**). All woody vegetation possessing a diameter at breast height (DBH) of 50 millimetres or greater within the secondary site plot quadrats were mapped using differential GPS technology and are structurally described in **Appendix E**.

A comprehensive description of vegetation sub-units is outlined in **Appendix F**.

3.3.1 Overview

The site is currently not utilised. The vegetation cover throughout the investigation area is comprised of low eucalypt woodland and mangrove shrubland to low closed forest.

A detailed floral inventory of the site recorded a total of:

- Sixty-four (64) families of native Australian and exotic flora;
- One hundred and forty-five (145) genera of native Australian flora and twenty-two (22) exotic (with 4 genera across both distinctions); and,
- One hundred and seventy-two (172) species of native Australian flora and Twenty-four (24) exotic.

3.3.2 Targeted Threatened Species Searches

Suitable habitat for *Solanum sporadotrichum, Atalaya rigida* and northern bonewood *Macropteranthes fitzilanii* was identified to the north of the site, upstream and along the central ephemeral watercourse. Dense microphyll rainforest/semi-evergreen vine thicket was recorded approximately 200 metres to the north.

The shrubs *Leucopogon cuspidatus* and *Ozothamnus eriocephalus* occur in open forests and woodlands on granite and potential habitat occurs on the site. However it has not been recorded locally.

Berrya rotundifolia and *Bonamia dietrichiana* potentially occur in REs types present on the site, though all known representations of the former occur on Whitsunday Islands. It is thought that *Berrya rotundifolia* is endemic to these islands.

In addition to the above species, the Terms of Reference (ToR) for the project identify five species (**Table 3.5**), four of which were not identified by the aforementioned searches (**Tables 3.2, 3.3** and **3.4**).

Table 3.5: Additional Listed Species Identified by the Terms of Reference

Species	Common Name	Conservation Status		Habitat/Notes
		NC Act	EPBC Act	
Rourea brachyandra	No common name	R		A liana of the upper canopy of rainforests and vine forests
Rhodamnia glabrescens	No common name	R		Shrub or small tree from rainforests and vine forests
Actephila sessilifolia	No common name	R		Shrub occurring on hillslopes in vine forests and thickets
Medicosma obovata	No common name	V	V	Small tree of dry vine thickets and vine forests
Brachychiton compactus	No common name	R		Small tree from dry vine thickets and vine forests

Detailed searches throughout the entire site did not reveal the presence of any species of threatened flora.

3.3.3 Communities

Approximately sixty per cent (60%) of the natural/near natural vegetation on the site is above high water mark and is vegetated with remnant (as defined by the VM Act) or near remnant low eucalypt woodland, and thirty per cent (30%) with mangrove shrubland to low closed forest. The balance of the vegetation on the site (approximately 10%) consists of regrowth eucalypt woodland, degraded wasteland (quarry), degraded roadside batters and power-line and road easements. The following floral assemblages were identified on site:

Community 1: Grey ironbark *Eucalyptus drepanophylla* low woodland to open forest

Overview
This community is generally comprised of and dominated by mature remnant grey ironbark *Eucalyptus drepanophylla* and brush box *Lophostemon confertus* on Mesozoic to Proterozoic igneous rocks, or grey ironbark with Queensland blue gum *Eucalyptus tereticornis* and Brush box within protected, unexposed slopes and drainage lines on Mesozoic to Proterozoic igneous rocks. Vegetation Community mapping is presented as **Figure 4**. This community possesses a high ecological value and landscape amenity and would greatly benefit from assisted rehabilitation.

Structural and Site Attributes
Soils comprise skeletal gravelly soils with south-western aspects. Gradients range from 3° to 15° across the community 3-5° in the east and 10-15° in the west.

The canopy layer possesses an median height of 10-12 metres, reaching a maximum height of 14-16 metres and a canopy cover of between 40 and 70%.

Floristics
The association is dominated by mature, wind-sheared grey ironbark *Eucalyptus drepanophylla*, brush box *Lophostemon confertus* and Shute Harbour white mahogany*Eucalyptus portuensis* with pink bloodwood *Corymbia intermedia,* long fruited bloodwood *Corymbia clarksoniana* occurring in lower densities. Occasionally *Acacia spirorbis ssp. solanderi* is present in the canopy. The basal area of the community ranges 15-18m^3/ha.

In parts a sub-canopy is present and dominated by juvenile canopy species and cockatoo apple *Planchonia decarya.* The mid-stratum is comprised of red ash *Alphitonia excelsa*, *Acacia spirorbis ssp. solanderi* and juvenile canopy species.

The shrub layer is generally dominated by grass tree *Xanthorrhoea johnsonii*, Cockatoo apple *Planchonia decarya*, *Pogonolobus reticulatus* and native gardenia *Kailarsenia ochreata*, with sporadic *Indigophora pratensis*, *Diospyros geminata*, red ground berry *Acrotriche aggregata*, *Acacia multisiliqua* and showy wattle *Acacia decora*. Within In more elevated central parts of this community adjacent to the northern boundary, the shrub layer is dominated by species characteristically associated with semi-evergreen vine thicket, including *Diospyros geminata*, *Diospyros hebecarpa*, *Psydrax odorata var. australiana* and *Bursaria tenuifolia*. This sub-association is associated with two steeply graded, ephemeral drainage lines.

The groundcover layer is dominated by two-coloured panic *Panicum effusum var. simile*, *Aristida queenslandica, Jasminum spp.* and many-flowered mat-rush *Lomandra multiflorum*.

The groundcover layer is dominated by saw sedge *Gahnia aspera*, mat rush *Lomandra filliformis*, many flowered mat rush *Lomandra multiflora,* blueberry lily *Dianella caerulea*, *Jasminum spp.,* corky passionvine *Passiflora suberosa*[*] and the grasses *Aristida queenslandica, Panicum decompositum* and two coloured panic *Panicum effusum var. simile.*

Condition and Weeds
A power-line easement running west to east transects the southern extent of the association, while the western extent (in the vicinity of the disused quarry), is heavily degraded with corky passionvine *Passiflora suberosa**.

Aside from the dominance of corky passionvine within the groundcover layer, the association presents in good health with an intact canopy and no signs of active timber-getting, chemical application or gross clearing. A vast majority of the Shute Harbour Shute Harbour white mahoganywere found to possess small

[*] exotic species, naturalised in Queensland

to mid-sized hollows (to 80mm) generally at the bend points in the main upper branches. The groundcover log distribution was approximately 15% of the total cover of the groundlayer.

Significant Species
With reference to the *NC(W) Regulation* and the *EPBC Act*, no endemic threatened species of conservation significance were recorded from this vegetation type.

Conservation Status
This community is analogous with remnant Regional Ecosystem (RE) 8.12.14. As of December 2005 (EPA 2005) this RE has a vegetation management status of *Not of Concern* and a biodiversity management status of *No Concern at Present*. Mapped analogous or equivalent REs are presented as **Figure 5**.

This community is not equivalent to any Threatened Ecological Community listed under the provisions of the *EPBC Act.*

Community 2: Queensland Blue Gum *Eucalyptus tereticornis* Open Forest

Overview
This community tends to represent a wetter vegetation typical of the description for RE 8.12.14 and occurs on the lower slopes and/or alluvial flats of coastal granite hills. The canopy layer is generally comprised of and dominated by mature Queensland blue gum *Eucalyptus tereticornis* and/or grey ironbark *Eucalyptus drepanophylla* or Queensland peppermint *Eucalyptus exsetra*. The community occurs along two major ephemeral drainage lines that occur in the central parts of the site. Vegetation Community mapping is presented as **Figure 4**.

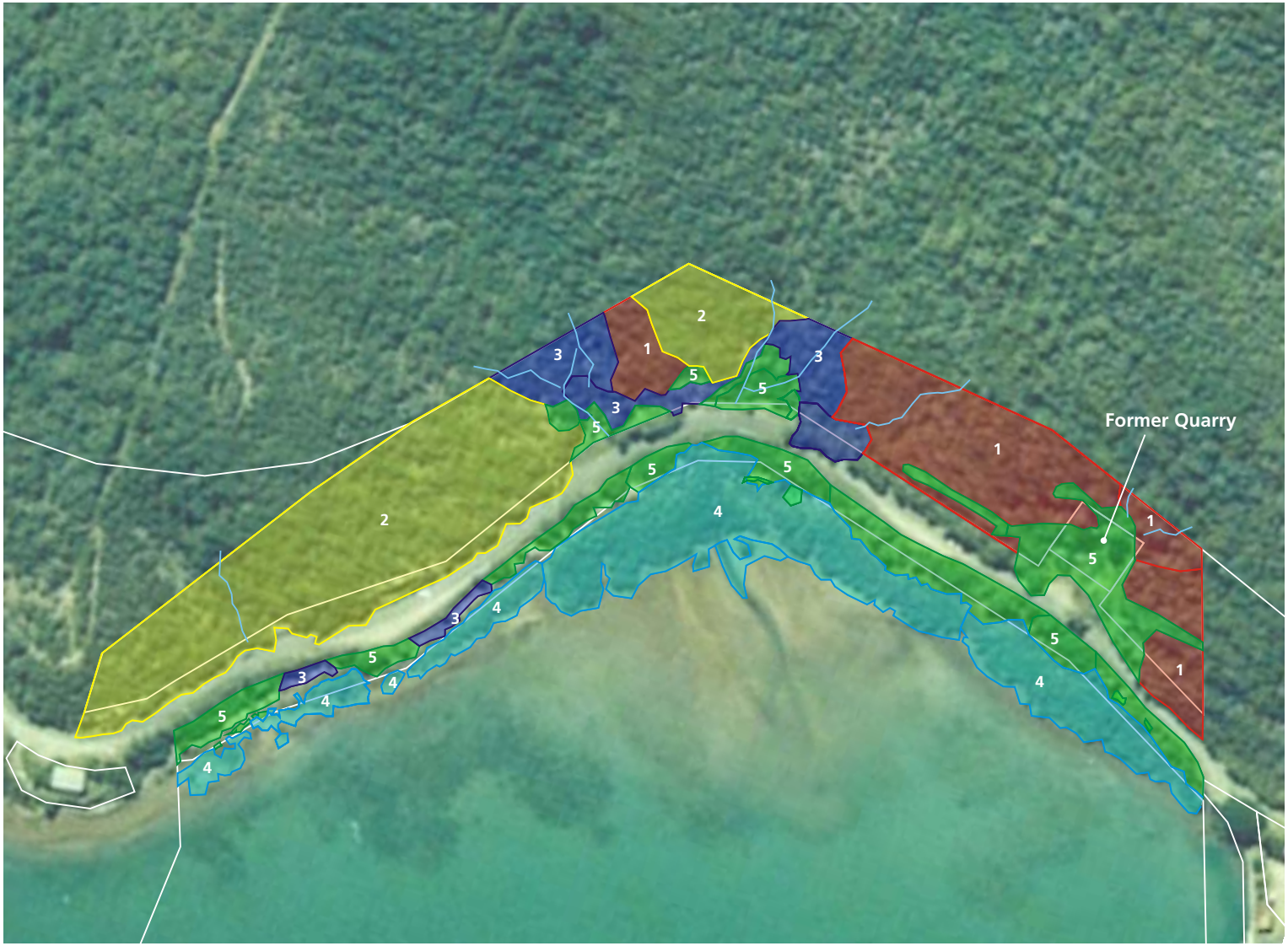
Structural and Site Attributes
This community is situated upon a coarse grained to gravel soils of colluvium and alluvial wash origin arising from upslope granite areas. Typically these soils contain a high component of silt and organic matter. Slope aspect is southerly and the gradient is relatively flat being less than 1-3^{o}. The batters of the associated toe of slope flowing into this association are similarly vegetated, if not reflective of an ecotonal merging with Community types 1 and 3.

The canopy layer possesses a median height of 14 metres and a canopy cover of between 20% and 70% (40%-70% along the northern boundary, and 30-40% closer to Proserpine - Shute Harbour Road). These lower areas have been markedly thinned and are reflective of an ecotonal merge with Community 4.

Floristics
The association is dominated by mature Queensland blue gum *Eucalyptus tereticornis,* Queensland peppermint *Eucalyptus exserta* with sporadic grey ironbark *Eucalyptus drepanophylla,* pink bloodwood *Corymbia intermedia* and Long-fruited bloodwood *Corymbia clarksoniana.* The average basal area of the community was 19m^{3}/ha.

The sub-canopy is generally comprised of juvenile canopy species and brush box *Lophostemon confertus* and *Bursaria tenuifolia.* In places, the latter species forms a dominant layer with the sporadic occurrence of vine thicket species such as *Mackinlaya macrosciadi*a, ribbonwood *Euroschinus falcata*, python tree *Austromyrtus bidwillii*, *Diospyros spp.*, beach cherry *Eugenia reinweinwardtiana* and hairy alectryon *Alectryon tomentosa* particularly in upstream areas.

The mid-stratum is dominated by screw palm *Pandanus spiralis* with sporadic occurrence of *Acacia multisiliqua,* red ash *Alphitonia excelsa*, native gardenia *Kailarsenia ochreata*, *Tabernaemontana orientalis, Endiandra meulleri,* ivory basswood *Polycias australiana* and mangrove wax vine *Cynanchum carnosum*. Closer to Proserpine - Shute Harbour Road the mid-stratum is relatively sparse and limited to a sporadic distribution of *Acacia spirorbis ssp. solandri*, screw palm *Pandanua spirilis*, milky mangrove *Excoecaria agallocha, Myoporum acuminatum* and white popinac *Leucanea leucocephala*.*



- Community 1 - Grey ironbark *Eucalyptus drepanophylla* low woodland to open forest
- Community 2 - Queensland Blue Gum *Eucalyptus tereticornis* open forest
- Community 3- White mahogany *Eucalyptus portuensis* low woodland to open forest
- Community 4 - Mangrove shrubland to low closed forest
- Community 5 - Degraded disturbance areas
- Waterways

50 0 50 100m approx.

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SHUTE HARBOUR

VEGETATION COMMUNITIES

FIGURE 04
DATE: 17/09/2007
DWG NO./ISSUE: SHU01_ECO_04/B
SCALE: AS INDICATED

The groundcover is dominated by the sedges *Fimbristylis spp.*, *Cyperus spp.,* the grasses native millet *Panicum decompositum*, Guinea grass *Panicum maximum var. maximum*,* the vines *Jasminum didymium,* mangrove wax-flower vine *Cynanchum carnosum*, *Centipeda minima,* corky passionvine *Passiflora suberosa* and a variety of herbaceous roadside/wasteland weeds.

Condition and Weeds
Aside from the dominance of Corky passionvine within the groundcover layer, the association presents in good health with an intact canopy and no signs of active timber-getting, chemical application or gross clearing. A number of mature Queensland blue gum (greater than 300 millimetre dbh) within the western portion of community 2 were found to possess small to mid-sized hollows (to 150 millimetre).

The community represents disturbed regrowth lower slope variant and was found be moderately to heavily degraded with grasses and herbaceous weeds associated with the nearby roadside batters. Due to the construction of Proserpine - Shute Harbour Road the association has lost its natural ecotone and hydrological regimes associated with the mangrove community the immediate south.

This community possesses a moderate ecological value and landscape amenity and would greatly benefit from assisted rehabilitation.

Significant Species
With reference to the *NC(W) Regulation* and the *EPBC Act* no endemic threatened species of conservation significance were recorded from this vegetation type.

Conservation Status
These associations are analogous with the lower slope variant of remnant Regional Ecosystem (RE) 8.12.14, (described above). As of December 2005 (EPA 2005) this RE has a vegetation management status of *Not of Concern* and a biodiversity management status of *No Concern at Present*. Mapped analogous or equivalent REs are presented as **Figure 5**.

This community is not equivalent to any Threatened Ecological Community listed under the provisions of the *EPBC Act.*

Community 3: Shute Harbour white mahogany *Eucalyptus portuensis* low woodland to open forest

Overview
This community is representative of Shute Harbour white mahogany *Eucalyptus portuensis* wind-sheared low woodland to open forest on granite coastal hills and occurring on south and east facing slopes. Vegetation Community mapping is presented as **Figure 4**.

Structural and Site Attributes
The community occurs on skeletal gravelly soils on south to east facing slopes with a gradient of 10 - 20°. A disused access track running west to east bisects the southern extent of the community.

The canopy layer possesses a median height of 6 to 8m and a canopy cover of between 40 and 60%.

Floristics
Shute Harbour white mahogany *Eucalyptus portuensis* dominates the canopy layer, while pink bloodwood *Corymbia intermedia*, brown bloodwood *Corymbia trachyphloia ssp. trachyphloia,* brush box Lophostemon confertus, Queensland peppermint *Eucalyptus exserta* and, to a lesser degree, long-fruited bloodwood *Corymbia clarksoniama* dominate the sub-canopy layer. The average basal area of the community was 22m^3/ha.

Remnant not of concern regional ecosystem
nb. RE types are noted

Area of remnant vegetation disturbance

N

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SHUTE HARBOUR
ANALOGOUS R.E. MAPPING DERIVED FROM VEGETATION COMMUNITIES

DATE: 03/07/2008
FIGURE NO: 05
DWG NO./ISSUE: SHU01_ECO_05/C
SCALE: NTS

The mid-stratum is densely vegetated and comprised of predominantly forest grass tree. Cockatoo apple, red ground berry, *Acacia multisiliqua*, *Pogonolobus reticulatus* and showy wattle *Acacia decora* occur commonly.

The groundcover layer is dominated by juvenile grass tree *Xanthorrhoea johnsonii*, two-colured panic *Panicum effusum var. simile*, *Aristida queenslandicum*, *Panicum decompositum* and *Lomandra spp.*

Condition and Weeds
The community presents in good health with an intact canopy and no signs of active timber-getting, chemical application or gross clearing. A vast majority of the Shute Harbour Shute Harbour white mahogany were found to possess small to mid-sized hollows (to 100 millimetres) generally at the bend points in the main upper branches. The groundcover log distribution was approximately 10% of the total cover.

Significant Species
With reference to the *NC(W) Regulation* and the *EPBC Act*, no endemic threatened species of conservation significance were recorded from this vegetation type.

Conservation Status
This community is analogous with remnant Regional Ecosystem (RE) 8.12.5c. As of December 2005 (EPA 2005) this RE has a vegetation management status of *Not of Concern* and a biodiversity management status of *No Concern at Present*. Mapped analogous or equivalent REs are presented as **Figure 5**.

This community is not equivalent to any Threatened Ecological Community listed under the provisions of the *EPBC Act.*

Community 4: Mangrove shrubland to low closed forest

Overview
This community is represented by dense mangrove low closed forest to shrubland within the western extent of the distribution. The associations dominate the entire seaward edge of the site located on the southern side of Proserpine - Shute Harbour Road. A small grove of this vegetation type was identified centrally within the site on the northern side of the road in association with a culvert necessary to collect and disperse flows from ephemeral drainage lines. Vegetation Community mapping is presented as **Figure 4**.

Structural and Site Attributes
The mangrove vegetation is situated upon estuarine clays and colluvial gravels. Rock pavement occurs commonly in the western and absolute eastern extent of the community. In general, the association has a southerly aspect with a grade of less than 4°. At the time of survey the moon was at the top of its cycle (full moon) and greater than 80% of the community was tidally inundated.

The canopy layer possessed a variable median height, ranging from 1.5 metre to of 4.5 metre and a variable canopy cover of between 40 and 90%.

Floristics
The community is dominated by red mangrove *Rhizophora stylosa*, tall stilted mangrove *Rhizophora apiculata* and large leaved orange mangrove *Bruguiera gymnorhiza* to 5m in height, predominantly on the seaward extent. Grey mangrove *Avicennia marina ssp. australasica a*nd myrtle mangrove *Osbornia octodonta* dominate the landward extent. Yellow mangrove *Ceriops tagal*, black mangrove *Lumnitzera racemosa* and milky mangrove *Excoecaria agallocha* occur sporadically within the landward and central extent. The midstratum is dominated by juvenile canopy species while the groundcover layer is virtually absent. Sporadic small patches of either marine couch *Sporobolus virginicus* and/or seablite *Suadea australis* were recorded at the absolute northern (landward) extent.

The small grove of marine vegetation on the landward (northern) side of Proserpine - Shute Harbour Road which is associated with a drainage culvert that routinely allows saltwater inundation consists of black mangrove *Lumnitzera racemosa* and milky mangrove *Excoecaria agallocha*, cottonwood *Hibiscus tiliaceus* and, to a lesser extent *Thespesia populnioides*. The median height of the association is 3.5m. The groundcover is dominated by mangrove wax-flower vine *Cynanchum carnosum* and marine couch *Sporobolus virginicus* with sporadic occurrences of river lily *Crinum pedunculatum* and sea rush *Juncus krausii*. Two large patches of marine couch *Sporobolus virginicus* with mangrove wax-flower vine *Cynanchum carnosum* were recorded immediately adjacent to this community.

Condition and Weeds

The community presents in good health with no die-back and limited to no weed incursion. Towards the western end of the proposed marina footprint, the mangroves are increasingly stunted from increased exposure to south-easterly winds, and a coarse substrate material (FRC 2007). FRC (2007) provide further analysis of the fisheries value of these mangroves, which has been assessed by FRC to be low. The small grove of marine vegetation on the landward (northern) side of Proserpine - Shute Harbour Road possesses the greatest of weed incursion.

Significant Species

With reference to the *NC(W) Regulation* and the *EPBC Act*, no endemic threatened species of conservation significance were recorded from this vegetation type.

Conservation Status

This community is analogous with remnant Regional Ecosystem (RE) 8.1.1. As of December 2005 (EPA 2005) this RE has a vegetation management status of *Not of Concern* and a biodiversity management status of *No Concern at Present*. This community possesses a high ecological value and landscape amenity. Mapped analogous or equivalent REs are presented as **Figure 5**.

This community is not equivalent to any Threatened Ecological Community listed under the provisions of the *EPBC Act.*

Community 5: Degraded disturbance areas

Overview

This map unit represents disturbance areas associated with a disused quarry and associated abandoned infrastructure, roadside batters and power-line easements. Vegetation Community mapping is presented as **Figure 4**.

Floristics

Roadside batters

This association is represented by fragmented groves of mid-mature regrowth along the seaward side of Proserpine - Shute Harbour Road. The composition of these associations is variable and in places appears to have been planted.

Tree species present include Queensland peppermint *Eucalyptus exserta*, grey ironbark *Eucalyptus drepanophylla.* Small trees and tall shrubs included cottonwood *Hibiscus tilaceous, Thespesisa populnoides, Acacia multisiliqua*, *Caesalpinia bonduc* and hoop pine *Araucaria cunnighamii.*

Shrubs groundcovers and grasses included *Vitex tifolia var. trifolia,* silver bush *Sophora tomentosa,* tree peach *Trema orientalis*, white popinac *Leucanea leucocephala*, s*crew pine *Pandanus spirilis*, grey mangrove *Avicennia marina*, milky mangrove *Excoecaria agallocha*, river lily *Crinum peduculatum*,

Pongamia pinnata, Clerodendrum inerme, *Acacia spirorbis ssp. solandri,* Guinea grass *Panicum maximum** and corky passionvine *Passiflora suberosa**.

Looking glass mangrove *Heritiera littoralis* occurs sporadically on the toe of the batter on the seaward side of the grove. A large amount of organic garden refuse was recorded at the eastern extent of the association.

Disused quarry

The natural landform and hydrological regimes have been markedly altered through quarrying for hard rock. The fringing edges of the quarry walls, quarry floor and areas immediately associated with an abandoned residence/office are dominated by Guinea grass *Panicum maximum**, corky passionvine *Passiflora suberosa*,* and sirato *Macroptilium atropurpureum**. Grey ironbark *Eucalypts denophylla*, Shute Harbour white mahogany*Eucalyptus portuensis* and large-fruited bloodwood *Corymbia clarksoniana* occur sporadically to the north-west of the residence. Isolated planted trees such as river oak *Casuarina cunninghamiana*, frangipani *Plumeria rubra cv "alba"**, siris tree *Albizia lebbeck* and cadaghi *Corymbia torreliana* occur to the south of the residence.

Power-line easement

A power-line easement transects the landward vegetation on the northern side of Proserpine - Shute Harbour Road, primarily within the eastern extent of the site. The easement runs from west to east and is approximately 8 metre wide and accessible to four-wheel vehicles. The community is restricted to a groundcover layer dominated by black spear grass *Heteropgon contortus*, two-coloured panic *Panicum effusum var. similie*, *Eriachne pallescens var. pallescens* and *Aristida queenslandica*. Regrowth *Acacia multisiliqua*, showy wattle *Acacia decora* and brush box *Lophostemon confertus* to 1 metre in height occur sporadically. The easement appears to be maintained by regular slashing.

Condition
The community, as a whole, presents in poor health with marked weed incursion and dominance particularly within the lower strata. Aside from preventing soil erosion and buffering the mangrove community the community provides limited ecological significance.

Significant Species
With reference to the *NC(W) Regulation* and the *EPBC Act*, no endemic threatened species of conservation significance were recorded from this vegetation type.

Conservation Status
This association is not analogous with any described regional ecosystem or any nationally listed Threatened Ecological Community.

3.3.4 Significance

Weeds

The twenty-five weed species present on the site are outlined in **Table 3.6.** This group includes one declared weed (Captain Cook tree *Thevetia peruviana*) listed as Class 3 under the *Land Protection (Pest and Stockroute Management) Act 2002*. All other weeds can be considered environmental weed. All weeds are represented in disturbed vegetation community 5, although corky passion vine *Passiflora suberosa* and Guinea grass *Panicum maximum var. maximum* have expanded also into adjacent remnant vegetation. On this basis, these could be considered to presently be the most invasive species of this group of environmental weeds.

Table 3.6: Significant Weed Species Recorded

Botanical Name	Common Name	Community	Form	Status
Plumeria rubra cv. `Alba'	Franjipani	5	sH	*
Theveta peruviana	Captain cook tree	5	sT	Class 3
Bidens pilosa	Cobbler's pegs	5	H	*
Tridax procumbens	Tridax daisy	5	H	*
Delonix regia (pl?)	Poinciana	5	sT	*
Drymaria cordata ssp. diandra	Tropical chickweed	2	H	*
Albizia lebbeck (NL,pl)	Siris tree	5	T	*
Crotalaria goreensis	Gambia pea	5	H	*
Crotalaria pallida	Streaked rattlepod	5	H	*
Leucaena leucocephala	White popinac	5	sH	*
Macroptilium atropurpureum	Siratro	5	H	*
Mimosa pudica	Sensitive Plant	5	sH	*
Bougainvillea sp. (NL,pl)	-	5	V	*
Passiflora foetida	Stinking passionfruit	5	V	*
Passiflora suberosa	Corky passionfruit	1,2,5	V	*
Chloris inflata	Purple-top chloris	5	G	*
Digitaria didactyla	Queensland blue couch	5	G	*
Melinis minutifolia	Molasses grass	5	G	*
Panicum maximum var. maximum	Guinea grass	2,5	G	*
Rhychlytrum repens	Red natal grass	5	G	*
Themeda quadrilateralis	Grader grass	5	G	*
Cotoneaster glaucophyllus (pl?)	Cotoneaster	5	sH	*
Richardia stellaris	-	5	H	*
Solanum nigrum	Blackberry Nightshade	5	H	*
Stachytarpheta jamaicensis	Blue snakeweed	5	sH	*

Notes

Declared Pest: species listed as class 2 or 3 pests subject to the *Land Protection (Pest and Stockroute Management) Act 2002*. ***Class 2*** pests are established in Queensland and have, or could have, an adverse economic, environmental or social impact. The management of these pests requires coordination and they are subject to local government-, community-, or landowner-led programs. Landowners must take reasonable steps to keep land free of Class 2 pests. ***Class 3*** pests are established in Queensland and have, or could have, an adverse economic, environmental or social impact. A pest control notice can only be issued for land that is, or is adjacent to, an environmentally significant area.

Environmental Weed: List of the 200 Most Invasive Environmental Weeds in SEQ – Pests that are not identified under State legislation but have high invasive potential and have been recognised by the EPA and NRW.

Form: grasses (graminaceous plants) (G), vines (V) herbs (H), vines (V), shrubs (sH), small trees (sT), trees (T).

Species

None of the species identified on the site:

- Are threatened species subject to the provisions of State or Commonwealth legislation;
- Are at the extent of their geographic range; or
- Represent an extralimital extension to a previously known geographic range.

Regional Ecosystems

Identification Process of Equivalent Regional Ecosystems and Remnant Status

As outlined, most of the vegetation communities of the site, with the exception of terrestrial vegetation closest to Proserpine - Shute Harbour Road and the former quarry site are relatively undisturbed (**Figure 4**) and have good ecological value and functioning.

Status
Analogous Regional Ecosystems on the site and their corresponding Vegetation Management and Biodiversity Management Status are presented as **Table 3.7**. The vegetation management status of these is presented diagrammatically as **Figure 5**.

All remnant vegetation on the site carries a vegetation management status of *Not of Concern* and a biodiversity management status of *No Concern at Present.*

Representation Regional Protected Areas
All the REs represented on the site are well represented in protected areas with the Central Queensland Coast Bioregion (**Table 3.7**).

3.4 Potential Effects and Management

3.4.1 Ecological Values & Biodiversity

Land to the north of Proserpine - Shute Harbour Road, which contains a significant extent of remnant vegetation (as defined by the VM Act) will be returned to public ownership.. Prior to dedication, previously disturbed areas will be revegetated with species endemic to adjacent terrestrial REs.

Significant and Threatened Species

No State or Commonwealth significant or threatened[11] species were found on the site or are predicted to potentially occur. Therefore the proposal is unlikely to significantly affect Matters or National Environmental Significance, relevant to Commonwealth threatened plant species or plant communities.

The site is mapped as containing Essential Habiltat for *Macropteranthes fitzlanii.* The vegetation assessment shows that the mandatory factors[12] (REs) and one of the four listed habitat factors[13] for this species are absent from the terrestrial vegetation communities that lie to the north of Shute Harbour Road Reserve. The remaining three habitat factors are present. These areas will not be affected by development and will be dedicated to EPA for incorporation into Conway National Park.

Threatened Ecological Communities

None of the vegetation communities identified on the site are considered Threatened Ecological Communities under the *EPBC Act*.

[11] EVR: endangered (E), vulnerable (V), rare (R) species subject to schedules 2, 3 and 4 of the Nature Conservation(Wildlife) Regulation 1994
[12] Mandatory factors for *Macropteranthes fizlani*: REs 8.3.10, 8.12.3, 8.12.11, 8.12.18
[13] Vegetation community habitat factor for *Macropteranthes fizlanii*: notophyll to complex notophyll vine forest; low microphyll vine forest; ecotone between mangroves and notophyll vine forest; littoral rainforest

Table 3.7: Summary Table of Equivalent Regional Ecosystem (*Vegetation Management Act*) Conservation Status

Community Description	Equivalent Regional Ecosystem				Notes
	Code	Description	VM Act Status	EPA Biodiversity Status	
1. Grey ironbark *Eucalyptus drepanophylla* low woodland to open forest	8.12.14	Variable eucalypt dominated associations, often with grey ironbark *Eucalyptus drepanophylla*, narrow leaved ironbark *E. crebra*, *Acacia spirorbis* subsp. *solandri*, brush box *Lophostemon confertus* and Queensland peppermint *E. exserta*, on islands and rocky headlands, on Mesozoic to Proterozoic igneous rocks, and Tertiary acid	Not Of Concern	No Concern at Present	A geographically restricted ecosystem mainly restricted to islands. Emphasis should be placed on the general principles of mosaic burning and diversity of fire types. Well represented in protected areas, mainly on Whitsunday Islands: Brampton Islands NP, Broadsound Islands NP, Cape Hillsborough NP, Conway NP, Dryander NP, Gloucester Island NP, Lindeman Islands NP, Molle Islands NP, Newry Islands NP, Northumberland Islands NP, Pioneer Peaks NP, Repulse Islands NP, Smith Islands NP.
2.Queensland Blue Gum *Eucalyptus tereticornis* Open Forest	8.12.5c	Shute Harbour white mahogany*Eucalyptus portuensis* and brush box *Lophostemon confertus* ± pink bloodwood *Corymbia intermedia* open forest. Occurs at low to moderate altitudes on near coastal hills on Mesozoic to Proterozoic igneous rocks	Not Of Concern	No Concern at Present	In the Whitsunday sub-region prone to development of dense vine thicket understorey which will eventually preclude burning. High fuel accumulations are possible and as such it is important to adopt fire regimes which will maintain fallen litter and timber habitats on the forest floor. Well represented in protected areas including Cape Palmerston NP, Conway NP, Dryander NP, Eungella NP, Homevale NP, Pioneer Peaks NP
3. Shute Harbour white mahogany*Eucalyptus portuensis* low woodland to open forest	8.12.14a	Variable eucalypt dominated associations, often with grey ironbark *Eucalyptus drepanophylla*, narrow leaved ironbark *E. crebra*, *Acacia spirorbis* subsp. *solandri*, brush box *Lophostemon confertus* and Queensland peppermint *E. exserta*, on islands and rocky headlands, on Mesozoic to Proterozoic igneous rocks, and Tertiary acid	Not Of Concern	No Concern at Present	A geographically restricted ecosystem mainly restricted to islands. Emphasis should be placed on the general principles of mosaic burning and diversity of fire types. Well represented in protected areas, mainly on Whitsunday Islands: Brampton Islands NP, Broadsound Islands NP, Cape Hillsborough NP, Conway NP, Dryander NP, Gloucester Island NP, Lindeman Islands NP, Molle Islands NP, Newry Islands NP, Northumberland Islands NP, Pioneer Peaks NP, Repulse Islands NP, Smith Islands NP.

Table 3.7: cont'd

Community Description	Equivalent Regional Ecosystem				Notes
4. Mangrove shrubland to low closed forest	8.1.1	Open-shrubland to closed forest of mangrove species forming a variety of associations, depending on their position in relation to tidal channels and the amount of freshwater input they receive on marine clay plains and estuaries	Not Of Concern	No Concern at Present	Scorching within the supra-littoral margin, particularly when this ecotone merges into flammable vegetation such as woodlands and forests of *Melaleuca* spp. Represented in protected areas including Bakers Creek CP, Byfield NP, Cape Palmerston NP, Conway NP, Dryander NP, Newry Islands NP, West Hill NP, Whitsunday Islands NP.
5. Degraded disturbance areas	Non-rem		Non-rem	Non-rem	

Regional Ecosystems

Figure 5 provides a representation of the interaction between the various proposed land use elements (wetland, marina and buffer areas). **Table 3.8** provides an analysis of the Regional Ecosystems within the total site area and those to be removed for the two development areas. Although the site comprises 41.1 hectares, 26.05 hectares consists of sub-tidal (marina basin) area.

This table shows that approximately 2.59 hectares of woody (remnant and regrowth) vegetation would be affected, of which 1.8 hectares is 'remnant' vegetation:

- The majority of this vegetation comprises mangrove RE8.1.1 (1.65 hectares) whose removal is not assessable under the VM Act[17] but which is the subject of a separate Department of Primary Industries & Fisheries (DPI&F) application process; and
- A small area of RE8.12.5 (0.05 hectares) and 8.12.14 (0.1 hectares) that lie within Proserpine-Shute Harbour Road reserve. This would be affected by road works associated with providing site access / improving traffic safety. Such RE removal would be exempted under the vegetation management code if these works were undertaken on behalf of a (Local) Governmant Authority.

All remnant marine wetland vegetation (RE 8.1.1) will be removed as a consequence of the marina development. The ecological effects and offset provisions for this loss are the subject of a separate marine ecological assessment.

None of the REs are 'at threshold' REs[18] such that clearing is likely to reduce the extent of remnant vegetation to an extent that results in it achieving a higher vegetation management status.

Table 3.8: Extent of Regional Ecosystem Disturbance

Comm.	Equivalent RE	Status		Total Area of Vegetation on Site (ha)	Area of Vegetation Removed (ha)			
		Vegetation Management	Biodiversity Management		Marina Basin	Commercial/ Residential Precinct	Infrastructure	Total
1	8.12.14a	Not of Concern	No Concern at Present	1.50	0.00	0.00	0.10	0.10
2	8.12.5c	Not of Concern	No Concern at Present	2.37	0.00	0.00	0.05	0.05
3	8.12.14a	Not of Concern	No Concern at Present	0.55	0.00	0.00	0.00	0.00
4	8.1.1	Not of Concern	No Concern at Present	1.67	0.00	0.84	0.81	1.65
5	Non-rem	nil	nil	1.36	0.00	0.05	0.74	0.79
Total				7.45	0.00	0.89	1.70	2.59

[17] Part 2, division 1, 8c of the VM Act notes that mangroves are not 'vegetation' as defined by the act
[18] http://www.nrw.qld.gov.au/vegetation/threshold_res.php accessed 1 May 2007

General Quality of Remnant Vegetation

The remnant vegetation on the site exhibits a moderate to high degree of integrity; it is structurally intact with little weed development. Weeds that are present tend to be clustered adjoining the remnant vegetation in disturbed sites. As the terrestrial components of the REs present on the site, to the north of Proserpine– Shute Harbour Road, adjoin Conway National Park, their value is additionally enhanced because of the buffer value they afford. Therefore rehabilitation of disturbed vegetation in this area could accompany landscaping and remnant vegetation edge sealing associated with Proserpine – Shute Harbour Road, prior to dedication of the land to QPWS for incorporation into Conway National Park.

Regional Vegetation Management Code

The project is a declared a significant project under the *State Development and Public Works Act 1971*, section 26 and will result in the clearing of native vegetation. For the purposes of completeness, the clearing is assessed under Part S of the Coastal Bioregions Regional Vegetation Management Code (**Table 3.9**).

3.4.2 Weeds

In order to prevent the spread of the declared (especially) and environmental weed species (**Table 3.5**) within or off-site, eradication prior to the commencement of works is highly recommended.

This group includes one declared weed (Captain Cook tree *Thevetia peruviana*) listed as Class 3 under the *Land Protection (Pest and Stockroute Management) Act 2002*. All other weeds can be considered environmental weed. All weeds are represented in disturbed vegetation community 5, although corky passion vine *Passiflora suberosa* and Guinea grass *Panicum maximum var. maximum* have expanded also into adjacent remnant vegetation.

On this basis, these could be considered to presently be the most invasive species of this group of environmental weeds. This does not discount the possibility that other species may become problematic should site conditions change. Given the site is located adjacent to an Environmentally Significant Area (as defined under this Act) being Conway National Park, it would be appropriate to remove primarily the three problematic species, and secondarily, the remaining environmental weed species. Post weed removal these areas should be revegetated with native species to seal disturbed areas to reduce re-establishment of new weed species.

The buffer areas of the site to the north of Proserpine – Whitsunday Road will remain undeveloped. There are no plans to fence this area or provide pedestrian access tracks. Therefore the risk of anthropogenic traffic in this area resulting in the introduction and establishment of weeds is low. There are a number of weeds that have established along the road reserve and although there are a few areas of disturbance associated with a powerline corridor, within this buffer area, these weeds have not invaded integral areas of vegetation in any significant sense and the quality remains good.

The introduction of weeds (and pathogens) through movement of earth moving equipment and importation of fill is a significant issue for any project where earthworks occurs. Movement of fill has the potential to facilitate the introduction of a number of weeds. To manage these potential impacts hard-rock fill should be sourced from quarry material and should be certified clean of weeds by the supplying quarry. Similarly, this also applies for non-rock fills, comprising earth, and soils for landscaping. Ideally, this material should not have been stockpiled for any significant period of time, unless it can be demonstrated that it had been covered. This should occur, irrespective of whether the supplier is located within a declared weed area or not.

As the site is adjoining Conway National Park, all earthmoving equipment arriving at the site must be certified clean of weeds and soil material (washed down prior to arriving at the site) and inspected by the site environmental officer. All vehicles arriving at the site dirty, or only partially clean should be denied entry.

Table 3.9: Assessment of Clearing Under Part S of the Coastal Bioregions Regional Vegetation Management Code

Performance Requirement	Response
PR S.1: Limits to Clearing To regulate the clearing of vegetation in a way that conserves remnant regional ecosystems, does not cause land degradation, prevents the loss of biodiversity and maintains ecological processes—subject to the limitations required to meet PR S.2 to PR S.10—clearing is limited to the extent that is necessary for the project, any associated ancillary works, and the operation of works that comprise a project declared to be a significant project under the *State Development and Public Works Organisation Act 1971* section 26.	Clearing will be limited to the extent necessary for the project and all ancillary and operation works have been considered. The proposal is for the final or ultimate development layout and there are no future stages of the project.

Performance Requirement	Acceptable Solution	Response
PR S.2: Wetlands To regulate the clearing of vegetation in a way that prevents the loss of biodiversity and maintains ecological processes—maintain the current extent of assessable vegetation associated with any natural significant wetland and/or natural wetland to provide— a) water quality by filtering sediments, nutrients and other pollutants; and b) aquatic habitat; and c) terrestrial habitat	**AS S.2** S.2.1 Clearing does not occur— a) in any natural wetland; and b) within 100 metres from any natural wetland; and c) in any natural significant wetland; and d) within 200 metres from any natural significant wetland.	No (palustrine) wetlands listed as wetland REs in Table 12 of the code are present on the site. No Ramsar wetlands are present.
PR S.3: Watercourses To regulate the clearing of vegetation in a way that does not cause land degradation, prevents the loss of biodiversity and maintains ecological processes—maintain the current extent of assessable vegetation associated with any watercourse to provide— a) bank stability by protecting against	**S.3.1** Clearing does not occur— a) in any watercourse; and b) within the relevant distance stipulated in Table 1, of each high bank of each watercourse.	Two stream order one waterways are present on the site (**Figure 4**). No clearing will occur within 50 metre of the high bank of either channel.

bank erosion; and b) water quality by filtering sediments, nutrients and other pollutants; and c) aquatic habitat; and d) terrestrial habitat.		
PR S.4: Connectivity To regulate the clearing of vegetation in a way that prevents the loss of biodiversity and maintains ecological processes—areas of remnant vegetation are— a) of sufficient size and configured in a way to maintain ecosystem functioning; and b) of sufficient size and configured in a way to remain in the landscape in spite of any threatening processes; and c) located on the lot(s) that are the subject of the application to maintain connectivity to remnant vegetation on adjacent properties	**AS S.4** S.4.1 Where clearing is less than— a) 10 metres wide; or b) 2 hectares; clearing does not— i) reduce the width of remnant vegetation to less than 200 metres; and ii) occur where the width of remnant vegetation is less than 200 metres; OR S.4.2 Clearing does not— a) reduce areas of contiguous remnant vegetation to less than 10 hectares; and b) occur in areas of contiguous remnant vegetation that are less than 10 hectares; and c) reduce the width of remnant vegetation to less than 200 metres; and d) occur where the width of remnant vegetation is less than 200 metres; and e) reduce the total extent of remnant vegetation to less than 30%; and f) occur where the total extent of remnant vegetation is less than 30%.	Minor clearing of terrestrial REs 8.12.5 and 8.12.14 may occur from within the gazetted road reserve of Proserpine-Shute Harbour Road for the purposes of providing safe site access and turning slots. No REs to the north of the road reserve will be affected. Existing ecological processes associated with these terrestrial REs (and non-remnant vegetation) will not be affected. Clearing will occur in marine REs located on the foreshore of Shute Harbour (RE8.1.1). Clearing of marine plant vegetation is the subject of a separate approval process by the DPI&F (this is outlined in the Marine Ecology Report). The marine vegetation habitats fringing the northern shore of Shute Harbour are discontinuous and not well developed when compared with the continuous band of mangrove communities that lines the southern side of Shute Harbour. On-site the vegetation averages 30 metres in width and the total areas comprises 1.65 hectares. It is not continuously connected to marine vegetation to the west or east. To the east lies foreshore development associated with the Whitsunday Boat Harbour / Ferry Terminal. Whilst development will result in the removal of all marine vegetation on the site, an offset is proposed for the dredge spoil disposal area located to the west of the western breakwall. This will result in a no worsening in the condition of connectivity on the site.
PR S.5 Soil Erosion To regulate the clearing of vegetation in a way that does not cause land degradation and maintains ecological processes—the effect of clearing does not result in—	**S.5.1** Mechanical clearing only occurs on— a) stable soils on a slope less than 30%; and	A site specific erosion and sediment control plan will be established for the widening of the road surface of Proserpine-Shute Harbour Road. Road, cutting and culvert design will be to established (state) road design standards to ensure no adverse long term erosion issues occur.

a) mass movement, gully erosion, rill erosion, sheet erosion, tunnel erosion, stream bank erosion, wind erosion, or scalding; and b) any associated loss of chemical, physical or biological fertility— including, but not limited to water holding capacity, soil structure, organic matter, soil biology, and nutrients, within and/or outside the lot(s) that are the subject of the application.	b) unstable soils on a slope less than 10%; and c) very unstable soils on a slope less than 1%.	Clearing will only occur in intertidal areas comprising sand with a veneer of gravel. This substrate will not be affected by any of the erosion processes, or affect any of the physico-chemical or biological processes outlined by this PR.
PR S.6: Salinity To regulate the clearing of vegetation in a way that does not cause land degradation and maintains ecological processes—clearing does not contribute to— a) waterlogging; or b) the salinisation of groundwater, surface water or soil.	S.6.1 Where clearing is less than— a) 2 hectares; or b) 10 metres wide; clearing does not occur in any discharge area. OR S.6.2 Where clearing is less than— a) 5 hectares; or b) 50 metres wide— clearing does not occur— i) in any discharge area; and ii) within 200 metres of any discharge area.	Proposed clearing of terrestrial REs is less than 2 hectares (0.15 hectares). Proposed clearing of marine REs is less than 2 hectares (1.65 hectares). Clearing *will not* occur in a groundwater discharge area.
PR S.7 Conserving remnant *endangered* regional ecosystems and *of concern* regional ecosystems		Clearing *will not* occur in any *endangered* or *of concern* regional ecosystems.

To regulate the clearing of vegetation in a way that conserves remnant *endangered* regional ecosystems and remnant *of concern* regional ecosystems—maintain the current extent of *endangered* regional ecosystems and *of concern* regional ecosystems.		
PR S.8: Essential habitat To regulate the clearing of vegetation in a way that prevents the loss of biodiversity— maintain the current extent of essential habitat.	**AS S.8** S.8.1 Clearing does not occur in an area shown as essential habitat on the essential habitat map.	Parts of the site are mapped as Essential Habitat for the Proserpine rock wallaby, rufous owl and *Macropteranthes fitzlanii* (**Figure 3b**). The terrestrial REs identified on the site contain Mandatory Factors and other factors for all of these species. Some clearing of RE 8.12.5 and 8.12.14 may occur (approx 0.05 ha of 8.12.5 and 0.1 ha of 8.12.14), however this will be limited in extent to areas within the existing gazetted road reserve of Proserpine-Shute Harbour Road. Such clearing would be exempt under the VM Act, if undertaken on behalf of a Government Authority. The majority of this clearing will occur towards the eastern extend of, and adjoining the mapped Essential Habitat. Adjoining estuarine wetland RE8.1.1 is not considered to be representative of Essential Habitat because mandatory factors and other factors (vegetation communities, soils, landscape position) indicative of essential habitat for these species are absent.
PR S.9: Conservation status thresholds To regulate the clearing of vegetation in a way that prevents the loss of biodiversity and conserves remnant regional ecosystems—maintain the current extent of regional ecosystems listed in Table 3.	**AS S.9** S.9.1 Clearing in a regional ecosystem listed in Table 3, does not occur unless the clearing is less than— a) 10 metres wide; or b) 2 hectares.	No clearing will occur in any remnant regional ecosystem identified by the Coastal Bioregions Regional Vegetation Management Plan (**Table 3**) as being at a Conservation Status Threshold.
PR S.10: Acid sulfate soils	**AS S.10**	All development with land zones 1 (marine sediments (areas containing RE8.1.1)) will be controlled by management plans

To regulate the clearing of vegetation in a way that does not cause land degradation and maintains ecological processes—clearing activities do not result in disturbance of acid sulfate soils or changes to the hydrology of the location that will either— a) aerate horizons containing iron sulfides; or b) mobilise acid and/or metals.	S.10.1 Clearing in land zone 1, land zone 2 or land zone 3 in areas below 5 metre Australian Height Datum— a) is carried out in accordance with an acid sulfate soils environmental management plan as outlined in the *State Planning Policy 2/02 Guideline Planning and Managing Development involving Acid Sulfate Soils;* and b) follows management principles in accordance with the Soil Management Guidelines in the *Queensland Acid Sulfate Soil Technical Manual*.	compliant with *State Planning Policy 2/02 Guideline Planning and Managing Development involving Acid Sulfate Soils* and *Queensland Acid Sulfate Soil Technical Manual*.

Escapes of landscape species from within the marina area could result in the establishment of these species within the buffer areas that adjoin Conway National Park. Therefore, landscaping efforts within the marina area and landscaping of the disturbed edges of Proserpine Shute Harbour Road should focus on the use of locally indigenous species found on the narrow littoral fringe of Shute Harbour. Suggested species suitable as street and amenity tree plantings are outlined below:

Large trees (>15m)

milky pine	*Alstonia scholaris*
hoop pine	*Araucaria cunninghamii*
hard quandong	*Elaeocarpus obovatus*
brush box	*Lophostemon confertus*
beach almond	*Terminalia catappa* (semi-deciduous)

Small trees (8-15m)

Red Eungella satinash	*Acmena resa*
hairy alectryon	*Alectryon tomentosa*
Whitsunday bottle tree	*Brachychiton compactus*
tuckeroo	*Cupaniopsis anacarinoides*
saffron heart	*Halfordia kendak*
coastal screw palm	*Pandanus spiralis*
canary beech	*Polyalthia nitidissima*
braod-leaved lilly pilly	*Syzygium hemilamprum* (syn. *Acmena hemilampra*)
a beach almond	*Terminalia melanocarpa* (deciduous)

***Shrubs* (<7m)**

beach acronychia	*Acronychia imperforata*
coogera	*Arytera divaricata*
coast canthium	*Cyclophyllum coprosmoides*
beach cherry	*Eugenia reinweinwardtiana*
gardenia	*Kailarsenia ochreata* (semi-deciduous)
cockatoo apple	*Planchonia decarya* (semi-deciduous)
brown gardenia	*Randia fitzilani*
a fan flower	*Scaevola taccada* (syn. *S. sericea*)
blue lilly pilly	*Syzygium oleosum*

Palms

alexandra palm	*Archontophoenix alexandrae*
weeping cabbage palm	*Livistonia decipens*
black palm	*Normanbaya normanbayi*
foxtail palm	*Wodyetia bifurcata*

Groundcovers

river lily	*Crinum pedunculatum*
flax lilly(s)	*Dianella spp.*
coastal boobioalla	*Myoporum acuminatum*
a boobialla	*Myoporum ellipticum*
a fan flower	*Scaveola caledulacea*

Rehabilitation of disturbed patches and edge sealing should focus on utilizing assisted regeneration through weed suppression and the use of native species identified for each of the REs identified on site.

Use of these species should focus on sourcing planting material developed from local genetic provenence. Additional benefits of using this material include, better adaptations to the climate and conditions of the

3.4.3 Bushfire Management

Native vegetation adjoining the development to the north of Proserpine - Shute Harbour Road is unlikely to pose a bushfire hazard to the development because of the distances between the vegetation and the nearest buildings (the tallest mature vegetation is 14 metres in height). Although some steep slopes occur to the north of the site the hazard is low. This is because greatest hazard is posed by fires starting on lower slopes and quickly progressing upslope on account of convective forces associated with the fire. The fire front would move upslope and away from the marina. In contrast any bushfire that started towards the top of the adjoining hills would be easily observed, progress slowly down the slope and would be readily controlled.

The risk of bushfires starting from the marina development is reduced by the fire break imposed by Proserpine - Shute Harbour Road. The most likely ignition sources for bushfire will be as a result of unauthorised use of the buffer lands by motorbike riders, bushwalkers and from the dumping of rubbish, although there is little evidence of these activities. The bushfire hazard associated with the vegetated slopes to the north of the marina is low.

Required bushfire management actions will need to focus on limiting fire ignition sources (ie. restricting illegal access to the site) and managing fuel loads although it is recommended that any consideration of fuel reduction burn be co-ordinated with the QPWS to ensure that the intended burn is consistent with guidelines for the REs to be burnt. The objective of managing the remaining areas of native vegetation will be to protect biodiversity, not to create an area of public open space. Restricting public access wherever possible will be a key action in bushfire prevention. General fire management principles are contained in **Table 3.10**.

Table 3.10: Fire Management Principles

Comm.	Equivalent RE	Status		Fire Management
		Vegetation Management	Biodiversity Management	
1	8.12.14	Not of Concern	No Concern at Present	Emphasis to be placed on the general principles of mosaic burn and diversity of fire types
2	8.12.5c	Not of Concern	No Concern at Present	Community prone to invasion by SEVT species in the understorey in absence of fire. Low intensity burns to occur in early winter, with focus on maintaining fallen timber and leaf litter
3	8.12.14a	Not of Concern	No Concern at Present	Emphasis to be placed on the general principles of mosaic burn and diversity of fire types
4	8.1.1	Not of Concern	No Concern at Present	Scorch from fires in adjacent woodlands, open forests and grasslands usually an issue; however Proserpine - Shute Harbour Road creates a natural fire break preventing damage to the extent of vegetation that will be retained
5	Non-rem	nil	nil	No specific requirement. Can be burnt as part of adjacent communities.

4.0 FAUNA

4.1 Scope

The primary aims of the fauna assessment were to:

- Identify the fauna species that inhabit or are likely to inhabit the study site;
- Determine the conservation status of these species in a local, regional, state and federal context;
- Identify fauna habitats and in particular habitats of significance; and
- Discuss likely impacts associated with the development and operation of the proposed Industrial Park and the effect on species and habitats within the area.

4.2 Desktop Review

4.2.1 Database Searches

In order to assist in the identification of the range of species which given suitable habitat and seasonal conditions, could utilise habitat types on the site the databases of the EPA (Wildlife online) and DEWR (Protected Matters Search Tool) were searched. Particular emphasis was placed on identifying state and nationally threatened species within these lists which might be present if suitable habitat was identified.

Records were obtained from a 5 kilometre buffer around a point located in the centre of the study site (coordinates: Latitude: - 20.2886, Longitude 148.7786). Results of the Wildlife On-line[19] (Qld) search are provided in **Appendix B.1** and results of the Protected Matters Database Search[20] (C'wlth) are outlines in **Appendix B.2**.

The search area covers an area much larger than the study site to maximise identification of regional flora species with the potential to occur on site. The presence of particular species in the results however does not imply that those species will definitely be found on the study site.

Of those species identified by database review, 8 are threatened species listed under the *NC(W) Regulation* (**Table 4.1**) and 11 are threatened species listed under the *Commonwealth EPBC Act* (**Table 4.2**). An additional 5 threatened species were identified from cross referencing the conservation listed species identified in the REDD database for the REs identified on the site (**Table 4.3**).

Additionally a number of international migratory species and subject to international agreements and national legislation have been recorded (**Table 4.4**) from the Protected Matters Database[#] or identified in REDD for REs mapped on the site.

[19] http://www.epa.qld.gov.au/nature_conservation/wildlife/wildlife_online (accessed 15/02/2006)

[20] http://www.deh.gov.au/erin/ert/epbc/index.html (accessed 15/02/2007)

[#] excludes those listed as threatened in **Table 4.1, Table 4.2** or **Table 4.3**

Table 4.1: Threatened Fauna Species Identified from Results of Wildlife Online Search

Species	Common Name	Conservation Status		Habitat/Notes
		NC Act	EPBC Act	
Reptiles				
Eulamprus amplus	orange-sided skink	R		Inhabits boulder outcrops among semi-deciduous microphyll or notophyll vine forest
Birds				
Accipiter novaehollandiae	grey goshawk	R	-	Heavily treed and humid forest areas such as rainforests and very dense, tall eucalypt forest.
Esacus neglectus	beach-stone curlew	V	-	Occurs on open, undisturbed beaches, islands, reefs, estuarine intertidal sandflats and mudflats; beaches with estuaries or mangroves nearby are preferred
Ephippiorhynchus asiaticus	black-necked stork	R	-	Inhabits permanent freshwater wetlands including margins of billabongs, swamps, shallow floodwaters, and adjacent grasslands and savannah woodlands; can also be found occasionally on inter-tidal shorelines, mangrove margins and estuaries.
Haematopus fuliginosus	sooty oystercatcher	R	-	Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide.
Numenius madagascariensis	eastern curlew	R	-	Inhabits beaches, estuaries, wetlands and sub-coastal plains
Ninox rufa queenslandica	rufous owl (southern)	V	-	Roosts and nests in gallery rainforest and paperbark *Melaleuca* thickets, along creeks, rainforest and mangrove edges and vine thickets, closed forest, open forest, tall forest
Mammals				
Dasyurus hallucatus	northern quoll	-	E	Open woodland and open forest types preferring rocky areas. Its greatest breeding success is known to occur at sites near water.
Petrogale persephone	Proserpine rock wallaby	E	E	Inhabits boulder outcrops among semi-deciduous microphyll or notophyll vine forest

Conservation Status: *Nature Conservation Act (Qld) 1992 (NC Act)* - endangered (E), vulnerable (V), rare (R); *Environment Protection and Biodiversity Conservation Act (C'wlth) 1999 (EPBC)* – endangered (E), vulnerable (V)

Table 4.2: Threatened Fauna Species Identified from Protected Matters Database

Species	Common Name	Type of Presence	Conservation Status		Habitat/Notes
			NC Act	EPBC Act	
Reptiles					
Caretta caretta	loggerhead turtle	Species or species habitat likely to occur within area	E	E	Marine, lays eggs on sandy oceanic beaches
Chelonia mydas	green turtle	Species or species habitat likely to occur within area	V	V	Marine, lays eggs on sandy oceanic beaches

Table 4.2: cont'd

Species	Common Name	Type of Presence	Conservation Status		Habitat/Notes
			NC Act	EPBC Act	
Delma labialis	striped-tailed delma	Species or species habitat likely to occur within area	V	V	Low open forest with a grassy understorey
Dermochelys coriacea	leatherback turtle	Species or species habitat likely to occur within area	E	V	Marine, lays eggs on sandy oceanic beaches
Egernia rugosa	yakka skink	Species or species habitat likely to occur within area	V	V	Desnse understoreys of dry woodlands and open forests; diurnal, sheltering in hollow logs, under tree roots or excavated burrows
Eretmochelys imbricata	hawksbill turtle	Species or species habitat likely to occur within area	V	V	Marine, lays eggs on sandy oceanic beaches
Lepidochelys olivacea	olive ridley	Species or species habitat likely to occur within area	E	E	Marine, lays eggs on sandy oceanic beaches
Natador depressus	flatback turtle	Species or species habitat likely to occur within area	V	V	Marine, lays eggs on sandy oceanic beaches
Birds					
Erythrotriorchis radiatus	red goshawk	Species or species habitat likely to occur within area	E	V	Sparsely distributed in coastal and subcoastal tall open forests and woodlands.
Geophaps scripta scripta	squatter pigeon (southern)	Species or species habitat likely to occur within area	V	V	Grassy woodlands and plains, preferring sandy areas and usually close to water
Macronectes giganteus	southern giant-petrel	Species or species habitat likely to occur within area	E	E	Pelagic (oceanic)
Pterodroma neglecta neglecta	kermadec petrel (western)	Species or species habitat likely to occur within area	-	V	Pelagic (oceanic)
Rostratula australis	Australian painted snipe	Species or species habitat likely to occur within area	R	V	Shallow freshwater wetlands or at the waters edge and on mudflats
Mammals					
Dasyurus hallucatus	northern quoll	Species or species habitat likely to occur within area	-	E	See **Table 4.1**.
Petrogale persephone	Proserpine rock-wallaby	Species or species habitat likely to occur within area	E	E	See **Table 4.1**.
Pteropus conspicillatus	spectacled flying-fox	Species or species habitat likely to occur within area	-	V	Camps are often found in patches of rainforest and swamps as well as mangroves. They feed on nectar and pollen of eucalypt blossoms; other blossoms and fruits
Xeromys myoides	water mouse/ false water rat	Species or species habitat likely to occur within area	R	V	Intertidal marine flats, saltmarsh and mangrioves

Conservation Status: *Nature Conservation Act (Qld) 1992 (NC Act)* - endangered (E), vulnerable (V), rare (R); *Environment Protection and Biodiversity Conservation Act (C'wlth) 1999 (EPBC)* – endangered (E), vulnerable (V)

Table 4.3: Threatened Fauna Species Identified from REDD for Mapped REs

Species	Common Name	Conservation Status		Habitat
		NC Act	**EPBC Act**	
Reptiles				
Crocodylus porosus	crocodile	V	-	Mangrove (RE 8.1.1)
Varanus semiremex	rusty monitor	R	-	Mangrove (RE 8.1.1)
Birds				
Calyptorhynchus lathami	glossy black cockatoo	V	-	Eucalypt open forest (RE 8.12.5)
Charadrius mongolus	Mongolian plover	-	M	Mangrove (RE 8.1.1)
Haematopus fuliginosus	sooty oystercatcher	R	-	Mangrove (RE 8.1.1)
Numenius madagascariensis	eastern curlew	R	M	Mangrove (RE 8.1.1)
Mammals				
Xeromys myoides	water mouse	R	V	Mangrove (RE 8.1.1)

Conservation Status: *Nature Conservation Act (Qld) 1992 (NC)* - endangered (E), vulnerable (V), rare (R); *Environment Protection and Biodiversity Conservation Act (C'wlth) 1999 (EPBC)* – endangered (E), vulnerable (V), migratory subject to international agreements (Japan-Australia Migratory Bird Agreement/China-Australia Migratory Bird Agreement) (M).

Table 4.4: Significant Species

Species	**Common Name**	**Conservation Status**			**Habitats**
		NC Act	**EPBC Act**	**JAMBA CAMBA**	
Birds					
Haliaeetus leucogaster	white-bellied sea-eagle	-	M		Waterways, coastal
Hirundapus caudacutus	white-throated needletail	-	M		Aerial
Hirundo rustica	barn swallow	-	M		Variety of terrestrial
Merops ornatus	rainbow bee-eater	-	M	X	Variety of terrestrial
Monarcha melanopsis	black-faced monarch	-	M		Variety of terrestrial
Monarcha trivirgatus	spectacled monarch	-	M		Variety of terrestrial
Myiagra cyanoleuca	satin flycatcher	-	M		Variety of terrestrial
Gallinago hardwickii	Latham's snipe	-	M	X	Wetlands
Nettapus coromandelianus albipennis	Australian cotton pygmy-goose	R	M		Wetlands
Numenius minutus	little curlew	-	M		Wetlands
Rostratula bengahlensis s. lat	painted snipe	V	M		Wetlands
Charadrius mongolus	Mongolian plover	-	M	X	Wetlands and Foreshore areas
Calidris tenuirostris	great knot	-	M	X	Wetlands and Foreshore areas
Numenius madagascariensis	eastern curlew	R	M	X	Wetlands and Foreshore areas
Xenus cinereus	terek sandpiper	-	M	X	Wetlands and Foreshore areas
Limosa lapponica	bar-tailed godwit	-	M	X	Wetlands and Foreshore areas
Numenius phaeopus	whimbrel	-	M	X	Wetlands and Foreshore areas
Pluvialis fulva	Pacific golden plover	-	M	X	Wetlands and Foreshore areas
Haematopus longirostris	pied oystercatcher	-	M		Wetlands and Foreshore areas
Arenaria interpres	ruddy turnstone	-	M	X	Wetlands and Foreshore areas
Ardea sumatrana	great - billed heron	-	M	X	Wetlands and Foreshore areas

Conservation Status: *Nature Conservation Act (Qld) 1992 (NC Act)* - endangered (E), vulnerable (V), rare (R); *Environment Protection and Biodiversity Conservation Act (C'wlth) 1999 (EPBC Act)* – endangered (E), vulnerable (V), migratory species (M); Species subject to international agreements (Japan-Australia Migratory Bird Agreement/China-Australia Migratory Bird Agreement) (M).

4.2.2 Essential Habitat

The site is mapped as containing essential habitat for Proserpine Rock-wallaby *Petrogale Persephone* and the Rufous Owl *Ninox rufa queenslandia* (**Figure 3b**). Habitat for the Proserpine Rock-wallaby *Petrogale persephone* primarily occurs in microphyll and notophyll vine forest/thicket (complex, semi-deciduous, semi-evergreen) but is also noted as including RE8.12.5 and RE8.12.14 where suitable rocky outcropping

occurs. Although both REs are present on the site to the north of Proserpine – Shute Harbour Road, no rocky outcropping occurs.

Roosting and foraging habitat for the Rufous Owl *Ninox rufa queenslandia* consists of lowland and highland tropical and subtropical rainforest (including gallery, mesophyll, microphyll and notophyll both simple and complex), mangrove edges and riparian paperbark (eg. *M. leucadendron*) forest bordered by savannah/open sclerophyll (eucalypt) woodland. The species nest in large tree hollow (<200cm deep & 45-60cm diameter) 3-40m above ground (trees used include *Eucalyptus tereticornis* and *Melaleuca* spp.) in or near thick rainforest near watercourses. On basis of Essential Habitat notes, potential foraging habitat on site includes RE8.1.1, RE8.12.5 and RE8.12.14. Roost habitat could potentially occur in the rainforest understorey that occurs along the western drainage line within RE, before emerging at night to forage in adjacent open forests and rainforest.

4.3 Field Survey

Details of the fauna survey methodology are outlined as **Appendix G**. A complete inventory of all fauna identified, and approximate distribution within the investigation area is outlined in **Appendix H**. Fauna habitats were derived from vegetation mapping compiled as part of this survey and sample sites and other fauna habitat features were plotted mapped using differential GPS technology (**Figure 6**).

4.4 Field Assessment Methodology

4.4.1 Habitat

A fauna habitat assessment was conducted to determine the site's broad habitat values. Specific searches were conducted for the following habitat features:

- Areas with a dense understorey which are favoured by small terrestrial mammals;
- Caves, culverts, trees containing large and small hollows and other similar structures as such features are used as roost or nest sites by a range of species;
- Waterways and wetlands;
- Rocky outcrops;
- Typically prominent nests of raptors;
- Insect and blossom producing habitats; and
- Rainforest habitats.

The quality of fauna habitat on the site was assessed on the basis of several criteria (see below). These criteria are altered as required to suit particular habitat types, such as wetlands or grasslands.

Low: Many fauna habitat elements in low quality areas have been removed or altered such as mature, hollow bearing trees, fallen timber and deep leaf litter. Remnants are often small in size, support substantial weed infestations and are poorly connected to other areas of remnant vegetation.

Moderate: Some habitat components are present but others are lacking. For example a remnant may have a reasonably intact understorey but lack fallen timber and hollow bearing trees. Linkages with other remnant habitats in the landscape may be lacking or somewhat tenuous.

High: Most habitat components are present (e.g. old-growth trees, fallen timber, lack of weeds), the remnant is large enough to support forest dependant species and it is well connected or contiguous with other areas of native vegetation.

4.4.2 Species

The primary goal of the survey was to assess the potential occurrence of, and likely impacts of development to, terrestrial fauna. Survey efforts were targeted to determine the likely occurrence of

fauna species listed as threatened under Commonwealth and Queensland legislation. Determining the suitability of the site for threatened fauna provides an indication of the overall habitat values of the site for a wider range of species.

The fauna field surveys were conducted between 22 to 26 August 2006. The purpose of which was to encounter as many of the fauna (mammals, birds, reptiles and amphibians) that occur on the site as possible as well as all incidental observations of fauna habitat and presence being recorded (e.g. scat collection, trunk scratching). Details of the methodology employed are identified in **Appendix G**.

Three traplines (**Figure 6**) were set across ecological gradients on the site, to sample all major habitat variants present. Two were included on southerly facing hillslope habitats, and a third was placed within and behind the mangrove zone.

Each trapline was assessed utilising a standardised suite of assessment techniques (see **Table 4.5**). Outside of these traplines, unusual sites or sites containing special habitat features were also searched. Traplines 1and 2 comprised each of 23 and 11 Elliott A (box) traps respectively; 2 and 1 cage traps respectively; 12 and 6 terrestrially mounted hair tubes respectively and 2 and 1 pit trap (4 x 20 litre buckets and 1 x 30 metre, 0.4 metre high drift of mosquito mesh), respectively.

The trap line within the mangrove habitat (Trapline 3) consisted of 9 Elliott A (box) traps, 1 cage trap and 10 terrestrial hair tubes. No pitfalls were established along this trapline as all suitable substrate in which to develop these traps would have been tidally flooded.

Non trapping sampling techniques were also employed. These consisted of direct searches for amphibians, reptiles and birds; spotlighting etc. Spotlighting for nocturnal species and electronic microchiropteran (insectivorous) bat call detection (Anabat) were employed in specific habitats (eg. rocky area, drainage lines), and randomly across the site. Remnant and disturbed habitats were surveyed bythese means.

In addition to these methods, other methods of detection included the collection of predator and herbivore scats for identification of species (based on presence grooming hairs) and prey type (hair and bone fragments). Additionally, bone fragments and skulls were collected for analysis by Barbara Triggs. Other characteristic signs of faunal activity, such as tracks in soft sand, scratches on smooth bark trees and signs of feeding (for example Glossy black cockatoo's feeding on seed capsules of *Allocasuarina* spp.) were undertaken during other assessments and/or checking trap lines.

An outline of survey effort and specific techniques employed for each fauna group is provided below (**Table 4.5**), and a summary of the techniques employed to determine the sites habitat values included trapping, observations and habitat assessment is provided following.

Table 4.5: Sampling Effort Summary

Method	Unit	Total
Elliott type A traps	Trap night	172
Cage traps	Trap night	16
Pitfall traps (4 buckets; 30 metre drift)	Trap night	48
Ground hair tubes	Hair tube night	116
Nocturnal arboreal and ground spotlighting	Person hours	8
Anabat Surveys	Person Hours	8
Active diurnal reptile ground searches	Person Hours	10
Diurnal bird searches	Person Hours	30
Nocturnal call playback	Person Hours	4

- Small Elliott
- Cage
- Pitfall

N

50 0 50 100m approx.

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SHUTE HARBOUR

TRAPPING LOCATIONS

FIGURE 06
DATE: 08/05/2007
DWG NO./ISSUE: SHU01_ECO_06/B
SCALE: AS INDICATED

Amphibians

Pitfall trapping, diurnal searches of shelter habitat, nocturnal searches using spotlight while traversing suitable habitat on foot and listening for frog calls.

Reptiles

Pitfall trapping, diurnal searches of shelter habitat and for basking and foraging reptiles along tracks, nocturnal searches using spotlight while traversing suitable habitat on foot.

Birds

Dawn bird surveys using binoculars and listening for bird calls, diurnal searches of suitable habitat, call playback surveys, nocturnal searches using spotlight while traversing suitable habitat on foot.

Mammals

Elliot traps, cage traps, hair tubes, pitfall traps, diurnal searches for shelter habitat, call playback surveys, anabat bat call recording, nocturnal searches using spotlight while traversing suitable habitat on foot.

4.5 Conditions

A summary of weather conditions for August 2006 is provided in **Appendix I**. Limitations of the study are outlined in **Appendix J**. Conditions during the survey period were generally warm, dry and sunny for most of the survey period. There was some light rain towards the end of the survey period (Friday night and Saturday). The intensity of wind and cloud cover varied marginally during the survey period. Conditions in the weeks leading up to the survey were much the same as those experienced during the survey period.

4.6 Results

4.6.1 Habitats

The results of the fauna survey indicate that habitat quality is high across much of the site, and low in disturbed areas. The site provides suitable habitat for a range of fauna groups. The site's fauna habitats can be broadly separated into the following categories:

- Rocky slopes and ridges supporting open forest with grassy understorey – Valuable forage habitat for amphibians and birds, forage and shelter habitat for reptiles and mammals. Connecting to more extensive areas of this habitat type in adjacent protected areas.

- Gullies supporting closed forest – Valuable forage habitat for rainforest birds and mammals, roost habitat for rufous owl, forage, shelter and breeding habitat for amphibians and reptiles. Connecting to more extensive areas of this habitat in adjacent protected areas. Connecting to potential shelter habitat for Proserpine Rock-wallaby.

- Open woodland lowlands – Moderate value forage habitat for all groups.

- Mangroves – Moderate value forage habitat for birds and potential low-tide forage habitat for water mouse.

- Tidal mudflats – Moderate value forage habitat for wading birds.

4.6.2 Species

A total of 41 species of terrestrial fauna were confirmed or tentatively identified based on remote observation or detection of non-specific signs, at the site. These were comprised of 7 species (3 families) of reptiles, 25 species (14 families) of birds and 9 species (8 families) of mammals. Details of the species recorded are presented below. Survey results and habitat assessment for each terrestrial vertebrate group are discussed below.

No species of conservation significance (threatened, rare or migratory) were identified on the site during the assessment.

Amphibians

WildNet database searches (**Appendix B.1**) indicate records for 10 amphibian species in the locality of the Subject Site, none of which are listed as threatened under Commonwealth or Queensland legislation.

No amphibians were recorded during the survey period, however small feeder creeks at the site may provide suitable breeding habitat for a range of common amphibian species known from the locality. Closed forest gullies and open forest slopes and ridges at the site may also provide suitable forage habitat for amphibians. The site does not support freshwater wetlands required by many amphibians as breeding habitat. Lower areas of the site are likely to be highly saline, and would not provide suitable habitat for amphibians. It is therefore highly unlikely that the proposed development at the site will result in any significant impacts on amphibian species known to occur in the wider locality.

It is unlikely that the site provides any significant values as a wildlife corridor for amphibian species.

Reptiles

WildNet database searches (**Appendix B.1**) indicate records for 32 reptile species in the locality of the site, including one Rare (*NC Act (NC(W) Regulation*)) species. The Commonwealth Protected Matters Database Searches tool indicates the potential occurrence of, or suitable habitat for, eight additional threatened (*EPBC Act*) reptile species (five marine turtles and two terrestrial lizards).

Seven reptile species were recorded at the site during the survey period, none of which are listed as threatened under Commonwealth or Queensland legislation. Given the diversity of habitats at the site, combined with the site's proximity to Conway National Park, it is likely that a range of reptile species occurs here. Much of the site's value as reptile habitat is provided in the form of closed forest gullies and open forest communities occurring along slopes and ridges. The low-lying areas of the site, particularly the mangrove communities, provide comparatively poor habitat for reptiles. As the proposed development will occur primarily in these low-lying areas, it is unlikely that it will result in any significant impacts on reptile species occurring at the site.

Orange-sided skink *Eulamprus amplus* listed as *Rare* under the NC Act was not recorded at the site during the survey period despite targeted surveys for this species. This species primarily occupies closed forest communities on granite outcrops and tree buttresses (Greer 2005). Suitable habitat for *Eulamprus amplus* occurs along the rainforest gullies of the site, particularly in the northern (uphill) areas of the site. It is possible therefore that this species occurs at the site, despite the absence of records during the survey period. The proposed development of the lower areas of the site is unlikely to have any significant impacts on suitable habitat for *Eulamprus amplus*.

The striped-tailed delma *Delma labialis* listed *Vulnerable* by both the NC Act and EPBC Act, occupies low open forest with a grassy understorey (Shea 1987), tending to occur in more open vegetation types on rocky slopes than in lowland areas (Low 1978). Suitable habitat for the striped-tailed delma *Delma labialis* occurs along the slopes of ridges at the site and, despite the absence of records during the survey period, this species may occur here. Development at the site is proposed to occur in the low-

lying areas, with little disturbance to suitable habitat for the striped-tailed delma *Delma labialis*. Suitable habitat for this species occurs to a much larger extent in protected areas adjacent to the site. It is therefore unlikely that the proposed development will result in any significant impacts on the striped-tailed delma *Delma labialis* at the site, should this species occur here.

No signs of occurrence of the yakka skink *Egernia rugosa* (NC Act *Vulnerable*; EPBC Act Vulnerable) were detected in any areas of the site during the survey period. This species typically occurs in communal burrows (Wilson 2005) in suitable habitat. No burrows or suitable habitat for yakka skink were recorded at the site during the survey period.

The rusty monitor *Varanus semiremex* is listed as Rare under the NC Act. This species typically occurs in mangrove habitats from Gladstone in the south to Cape York in the north. Suitable habitat for the rusty monitor *Varanus semiremex* occurs at the site and, despite the absence of local database records, a targeted survey was conducted to determine the occurrence of this species on account of its conservation dependence on RE8.1.1 being noted by the REDD Database. During the survey period, the rusty monitor *Varanus semiremex* was not recorded at the site. Despite the occurrence of suitable habitat, the rusty monitor *Varanus semiremex* may be locally extinct in the locality. It is therefore unlikely that the proposed development at the site will result in any significant impacts on this species.

No observation of, or detection of the presence of the crocodile *Crocodylus porosus* which is listed as *Vulnerable* by state legislation (NC Act) were made during the assessment. Although primarily associated with estuarine and freshwater habitats in rivers (no habitat is present on the site), larger crocodiles are occasionally encoundered in open ocean and embayments as they disperse between river systems. While in theory this species could be found in Shute Harbour, the intertial site is unlikely to be habitat for the crocodile.

Mangroves within the intertidal (southern extent) of the site are separated from the remainder of the site by a steep slope of road base and a sealed bitumen road (Proserpine-Shute Harbour Road). The area to the south of the road is entirely inundated at high tide, and therefore unsuitable as nesting habitat for any marine turtles. The proposed development is therefore unlikely to result in any significant impacts on nesting marine turtles at the site.

The foreshore of the site between mean sea level and mean high water springs consists of a low mangrove closed forest fringe, with a rocky and stony beach. Between the landward extent of the mangroves, and the embankment of Proserpine – Shute Harbour Road is a narrow band (2-3 metres) of the upper tidal plane. This area is typically stony/rocky with a few halophytic species. The highest astronomic tide (HAT) line occurs at the toe of the fill for the road. Typically, marine turtle rookeries occur well above HAT on open, sandy beaches. These characteristics afford easy unimpeded access to rookery sites that are above tidal inundation which would suffocate the eggs, and in a sandy medium that is easy to excavate.

No sign of turtle rookeries were detected on the site, and the site is unlikely to comprise rookery habitat. The Whitsundays have been identified more as feeding habitat for sea turtles, rather than nesting habitat. However, sea turtle mating and nesting has been observed in areas surrounding the Subject Site. Turtles have been recorded nesting at Whitehaven Beach to the east, Bowen Beach to the north and Midge Point to the south (Caroline Williams Senior Conservation Officer, QPWS (Whitsunday), *pers. comm.,* 4 May 2007). Sea turtles have been recorded foraging within Shute Harbour, where an enforced 6 knot speed limit minimizes the potential for boat strikes.

Given the sites location at the edge of the tidal limit and its proximity to a busy sealed road, it is unlikely that the site contributes significantly as wildlife corridor for any reptile species.

Birds

WildNet database searches (**Appendix B.1**) indicate records for 137 bird species in the locality of the site, including five state threatened (NC Act) species. The Commonwealth Protected Matters Database Search Tool indicates the potential occurrence of, or suitable habitat for, five additional threatened (Commonwealth EPBC Act 1999) bird species.

During the survey period, 25 bird species were recorded at the site. Given the combination of habitat diversity (closed forest, open forest, mangrove communities) and the sites proximity to Conway National Park it is likely to support a much larger number of bird species than were recorded during the survey. In particular, many migratory and nomadic species would occupy the site during the summer months. However, the site does not support any habitat type that is not found to a much larger extent in adjacent areas.

The most valuable habitat for small passerines at the site were the well vegetated gullies, which support closed forest suitable for a range of rainforest birds.

The southern giant petrel *Macronectes giganteus* (NC Act *Endangered*; EPBC Act *Endangered*) and kermadec petrel *Pterodroma neglecta neglecta* (EPBC Act Vulnerable) are both oceanic (pelagic) bird species. These birds generally occur beyond the continental shelf, although they are occasionally recorded from inshore waters or as beach-washed specimens during storm conditions. Breeding occurs on sub-Antarctic islands (southern giant petrel *Macronectes giganteus*) or Lord Howe and Norfolk Islands kermadec petrel *Pterodroma neglecta neglecta*. The site does not provide any suitable habitat for oceanic bird species. The proposed development at the site is highly unlikely to have any significant impacts on these species.

The site does not support freshwater wetlands and is therefore unsuitable as habitat for the Australian painted snipe *Rostratula australis* (NC Act *Rare*; EPBC Act *Vulnerable*) or many other wetland birds. The Black-necked Stork *Ephippiorhynchus asiaticus* (NC Act *Rare*), beach stone-curlew *Esacus neglectus* (NC Act *Vulnerable*), sooty oystercatcher *Haematopus fuliginosus* (NC Act *Rare*), eastern curlew *Numenius madagascariensis* (NC Act *Rare*) and a range of migratory wading birds protected under international agreements (eg. JAMBA, CAMBA see **Tables 4.3** and **4.4**) may all forage occasionally in mangrove and tidal mudflats at the site, although none were recorded here during the survey period. Given the relatively small area of forage habitat for these species here, development of the site is unlikely to result in any significant impacts on marine wetland birds at the site. The sooty oystercatcher nests predominantly on rocky shores of offshore islands, while the Beach Stone-curlew utilises sandy shorelines for nesting. The shoreline of the site is narrow, and there is no area of the site above the HAT that would support suitable nesting habitat for either of these species. Given the proximity of a major road, it is highly unlikely that either the sooty oystercatcher or the beach stone-curlew would nest at the site.

The southern species of the squatter pigeon *Geophaps scripta scripta* (NC Act *Vulnerable*; EPBC Act *Vulnerable*) is uncommon in settled coastal areas of Queensland (Pizzey 2001). This species was not detected during the survey period. Habitat assessment indicates that the site is generally unsuitable for the species as it prefers sandy woodlands near freshwater. Suitable habitat for the squatter pigeon *Geophaps scripta scripta* (open woodland with grassy understorey) occurs more extensively in areas adjacent to the site. It is therefore highly unlikely that the proposed development at the site will have any significant impacts on this species.

Database searches indicate that the rufous owl *Ninox rufa queenslandica* (NC Act *Vulnerable*) and grey goshawk *Accipiter novaehollandiae* (NC Act Rare) are known to occur in proximity to the site. In addition, Protected Matters Database Search Tool indicates the potential occurrence or suitable habitat for the red goshawk *Erythrotriorchis radiatus* (NC Act *Endangered*; EPBC Act *Vulnerable*) in the area. During the field surveys, none of these threatened species were recorded at the site. Habitat

assessment indicates that the site may provide suitable forage, roosting or breeding habitat for these species.

The red goshawk *Erythrotriorchis radiatus* in particular is known to occupy vast home ranges and detection of this extremely rare bird while it is foraging is difficult. The grey goshawk *Accipiter novaehollandiae* occupies closed forest types including mangroves, but is sparsely distributed throughout its range, and rare. For this reason targeted searches were conducted to detect nesting and roosting sites for the rufous owl *Ninox rufa queenslandica*, grey goshawk *Accipiter novaehollandiae* and the red goshawk *Erythrotriorchis radiatus* at the site. None of these were recorded during the survey period. It is likely that the site occasionally provides forage habitat for all species and potential roost habitat for the rufous owl *Ninox rufa queenslandica*.

It is acknowledged that all raptor species have large home ranges, encompassing a matrix of forage, roosting and breeding habitats. It is therefore possible that the site may form a component of the much larger home ranges of any of the threatened raptor and owl species known from the wider locality. It is unlikely however that the proposed development of the site will have any significant impacts on threatened owl and raptor species.

Development of the site is unlikely to result in any significant reduction in wildlife corridor values for birds in the wider area.

Although searches for wader birds were undertaken few were observed. This is not surprising given the timing of the study. Many of the international migrants, are not present in Australia in August. Although the site is not part of any known significant marine wetland or aggregation site, there is suitable, though not expansive habitat that could occasionally support wader bird. Visitations are likely to be random as a result of nomadic dispersal throughout suitable coastal habitat. None of these are likely to breed at the site.

Mammals

WildNet database searches (**Appendix B.1**) indicate records for 23 non-marine mammal species in the locality of the site, including two Endangered (EPBC Act and NC Act) species (**Table 4.1**). The Commonwealth Protected Matters Database Search Tool indicates the potential occurrence of, or suitable habitat for, two additional threatened (EPBC Act and NC Act) mammal species (**Table 4.2**).

During the survey period, nine mammal species were recorded at the site. The site provides suitable habitat for a range of mammals known to occur in the wider area. The site's proximity to Conway National Park provides habitat connectivity for mammals to much more extensive areas of suitable habitat. All suitable habitats for mammals at the site are well represented in the wider locality, and development of the site is therefore unlikely to result in any significant impacts on common mammal species known to occur here.

The northern quoll *Dasyurus hallucatus* (EPBC Act *Endangered*) has been recorded in the locality by the WildNet database. It is most abundant in rocky eucalypt woodland but is also known to occur in a range of vegetation types, mostly within 200 kilometres of the coast. It makes its dens in rock crevices, tree holes or occasionally termite mounds. During the survey period, no signs of northern quoll *Dasyurus hallucatus* occurrence (tracks, scats, feeding sites) were recorded at the Subject Site. However, suitable forage and den habitat for the northern quoll *Dasyurus hallucatus* occurs along the slopes and ridges of the site, and this species may therefore occur here despite the absence of records during the survey period. Suitable habitat for the northern quoll *Dasyurus hallucatus* is more extensively represented in the adjacent Conway National Park, and the location of the proposed development in low-lying areas of the site will result in no significant impacts on northern quoll *Dasyurus hallucatus* that may occur in the wider locality.

The Proserpine rock-wallaby *Petrogale persephone* (NC Act *Endangered*; EPBC Act *Endangered*) has been recorded in the locality by the WildNet database. It inhabits rock piles, rocky outcrops and cliffs within a preferred microphyll/notophyll semi-deciduous dry vine forest (Nolan and Johnson 2001). Although not recorded during the survey period, suitable habitat for the Proserpine rock-wallaby *Petrogale persephone* occurs in gullies to the north of the site. This species may therefore occur immediately to the north of the site, and may occasionally descend gullies to forage at the site at night. Despite this, it is unlikely that development of the site will result in any significant impacts on Proserpine rock-wallaby *Petrogale persephone* that may occur in adjacent areas to the north of the site. The site does not provide wildlife corridor values for this species.

The spectacled flying-fox *Pteropus conspicillatus* (EPBC Act *Vulnerable*)was identified by the Commonwealth Protected Matters Database Search Tool which indicates the potential occurrence of, or suitable habitat for this species. It generally occurs to the north of Shute Harbour, south to about Tully (Menkhorst 2001). This species was not recorded at the site during the survey period. No roosting/breeding colonies of any flying-fox species were recorded from the site. Although it is possible that the spectacled flying-fox may infrequently forage in the locality of the site, it is highly unlikely that the proposed development at the site will result in any significant impacts on this species.

The water mouse *Xeromys myoides* (NC Act *Rare;* EPBC Act *Vulnerable*) was identified by the Commonwealth Protected Matters Database Search Tool which indicates the potential occurrence of, or suitable habitat for this species. It occurs in tidal mangrove and adjacent saltmarsh communities. Targeted surveys failed to record signs of Water Mouse occurrence (nest mounds, feeding areas, tracks and scats) at the site during the survey period. Habitat assessment indicates that suitable high-tide nesting habitat for the water mouse *Xeromys myoides* does not occur at the site. However, tidal mangrove communities may provide suitable low-tide forage habitat for the water mouse *Xeromys myoides*, despite the absence of records during the survey period. It is therefore possible that, despite failure to detect this species, the Water Mouse may occur in the wider locality, albeit at very low density. It is however unlikely that the proposed works will result in any significant impacts on water mouse *Xeromys myoides* populations that may occur in the wider locality. The site does not provide wildlife corridor values for the water mouse *Xeromys myoides*, as there is very little suitable habitat for this species to the west of the site.

4.7 Potential Effects and Management

4.7.1 Extent of Habitats Affected

Development of the site will result in the removal of 0.15 hectares of woodland/open forest and 1.65 hectares of mangrove shrubland habitat from the site.

The terrestrial habitat types are well represented in the locality (extensive with adjacent Conway National Park) and regionally. All equivalent REs have a vegetation management status of *Of no Concern,* and a Biodiversity (EPA) status of *No Concern at Present,* and as such have greater than 30 % of their pre-clearing extent remaining in the Central Coast Bioregion (refer **Table 3.7**).

Mangrove habitats are well represented within Shute Harbour and the broader Whitsunday Region. The marine vegetation habitats fringing the northern shore of Shute Harbour are discontinuous and not well developed when compared with the continuous band of mangrove communities that lines the southern side of Shute Harbour.

On-site the vegetation averages 30 metres in width and it is not continuoiusly connected to marine vegetation to the west or east. To the east lies foreshore development associated with the Whitsunday Boat Harbour / Ferry Terminal. The implication of the extent of local and regional impacts of the development on mangroves is considered in the Mariane Ecology Report.

4.7.2 Essential Habitat

The site is mapped as containing Essential Habtat for rufous owl and potentially Proserpine rock-wallaby. The vegetation assessment shows that the mandatory factors[21] (REs) and one of the four listed habitat factors[22] for this species are absent from the terrestrial vegetation communities that lie to the north of Shute Harbour Road. The remaining three habitat factors are present. The majority of impact will occur in marine plant communities represented by RE8.1.1. This RE is not mapped as essential habitat for either species. REs comprising mandatory factors for the species, may be affected but only in a very minor way. Potentially, up to 0.15 hectares of these REs (refer **Table 3.8**) occuring within the Proserpine-Shute Harbour Road Reserve may be cleared for provision of turning slots and passing lanes associated with the marina. The majority of this likely impact will occur outside the area identified in **Figure 3b** as Essential Habitat. Removal of this vegetation will not affect viable habitat networks for these species.

All terrestrial habitat located to the north of Proserpine-Shute Harbour Road Reserve will be returned to public ownership.

4.7.3 Ecological Corridor Issues

The terrestrial components of the site forms part of a large contiguous patch of remnant open and closed forest habitat that encompasses Conway National Park. Generalised movement of animals through the site is most likely to be east – west. The presence of Proserpine-Shute Harbour Road and the intertidal plane to the south of the site is likely to exclude most movement of fauna north to south on account of an absence of suitable habitat. However some of the larger bird and bat species may fly between the site and the southern sections of Conway National Park, across Shute Harbour.

Generalised north-south movement of terrestrial animals is likely to occur through suitable forest habitat that links the southern and northern section of the park two kilometers to the west of the site. This linkage is however bisected by Proserpine – Shute Harbour Road.

The intertidal marine vegetation community extends through the site to the west and east. Construction of the marina would disrupt longitudinal wading movement along the beach by intertidal fauna, principally waders. However as they are mobile species the imposition of a marina would not be a significant impact.

4.7.4 Biodiversity

Overall, the impacts of proposed development at the site on fauna groups are likely to be minimal.

Field surveys and habitat assessment indicate that the optimal location for any development at the site would be in the low-lying areas, particularly south of the existing road. Locating the development in these areas would result in minimal impacts on fauna habitat along slopes and ridges, which continues into more extensive areas of habitat in the adjacent Conway National Park. In order to retain some fauna habitat values at the site, particularly for orange-sided skink *Eulamprus amplus*, rufous owl *Ninox rufa queenslandica* and Proserpine rock-wallaby *Petrogale persephone* that may occur in adjacent protected areas, it is recommended that areas of riparian vegetation along the sites gullies should be retained, where these occur to the north of Proserpine – Shute Harbour Road.

Establishing riparian buffers along gullies will provide protection for any suitable breeding habitat for amphibians that may occur at the site, in particular those that may descend gullies from the adjacent Conway National Park to breed. Riparian vegetation is also likely to be the most valuable forage habitat for amphibians at the site. Many reptile species would also occur in riparian communities, and would therefore benefit from establishing riparian buffers. In addition, avoiding development along slopes and

[21] Mandatory factors for rufous owl and Proserpine rock wallaby: REs 8.12.5, 8.12.14

[22] Vegetation community habitat factor for *Macropteranthes fizlani*: notophyll to complex notophyll vine forest; low microphyll vine forest; ecotone between mangroves and notophyll vine forest; littoral rainforest

ridges will assist in retaining suitable habitat for the striped-tailed delma *Delma labialis* that may occur in the wider locality.

Under the proposed development all existing vegetation to the north of Proserpine - Shute Harbour Road will not be adversely impacted upon by the development, and will be returned to public ownership.

As discussed, the majority of migratory wading birds are summer migrants. Most occur in the locality of the site between August and May, with the exception of over-wintering individuals of some species. It is therefore desirable to undertake the proposed works at the site between May to August to avoid unnecessary impacts on the feeding patterns of these species. However, construction works that continue beyond August should not have any significant impacts on these species. Restricting construction to the winter months will also assist in mitigating unnecessary impacts on most bird species that breed in spring.

During construction, all efforts should be made to reduce toxins (chemical spills, waste material etc) that may be washed into Shute Harbour and settle as sediment. This is likely to have an adverse impact on the benthic fauna that forms the staple diet of migratory wading birds (as well as marine aquatic fauna). Bio-accumulation of toxins may also have an adverse effect on breeding success for these species in the northern hemisphere.

Completion of the proposed marina is likely to result in the loss of a small area of potential forage and roosting habitat for a number of migratory wading birds protected under JAMBA, CAMBA and Queensland's *Nature Conservation Act 1992*. However, given the extent of similar shoreline habitat protected within Conway National Park and offshore islands it is highly unlikely that the loss of this habitat will result in any significant impacts on migratory waders that occur in the wider area. Progressive, ongoing deposition of marina dredging spoil to create the western isthmus of the marina will result in the creation of suitable roosting and foraging habitat for migratory wading birds, thus offsetting the removal of a small area of habitat for construction of the marina. The development of marinas in other areas of Queensland (e.g. Manly, Shorncliffe and Raby Bay in Southeast Queensland) does not appear to have resulted in any significant impacts on waders occupying nearby forage and roosting habitat (*pers. obs*.).

It is unlikely that construction of the proposed marina and associated development at the site will result in any significant impacts on the Proserpine rock-wallaby *Petrogale persephone*, spectacled flying-fox *Pteropus conspicillatus*, northern quoll *Dasyurus hallucatus* or water mouse *Xeromys myoides*. However, the potential for impacts on these species may be minimised by employing a survey for these species immediately prior to the commencement of clearing and construction.

North/south movement across Proserpine - Shute Harbour Road by Proserpine Rock-wallabies is unlikely within the boundaries of the site, as there is no suitable habitat for this species on the south side of the road. Review of *The Recovery Plan for the Proserpine Rock-wallaby Petrogale persephone 2000 – 2004* (Nolan and Johnson 2001) to determine likely corridors based on identified or predicted attributes indicates that the existing Proserpine – Shute Harbour Road bisects a large area of suitable habitat for Proserpine Rock-wallabies approximately 2-4 kilometres to the west of the site.

Nolan and Johnson (2001) identify road mortalities as a significant threatening process to this species. Known crossing points for the Proserpine Rock-wallaby *Petrogale persephone* are associated with a ridge known as Flametree Hill situated between Mandalay and Shute Harbour some 4 kilometres to the west of the marina site. Flametree Hill is a known hot-spot for vehicle strike. Actions have already been undertaken jointly by Queensland Parks and Wildlife Service and Main Roads Department to reduce road kills in this area. These have included revegetation of road verges and the trial of roadside wildlife reflectors (Barry Nolan, Senior Ranger Airlie Beach Central Region – QPWS, pers. comm., 9 May 2007).

As development of the marina site has the potential to increase the volume of traffic along Proserpine - Shute Harbour Road, particularly during daylight hours. However there is potential for vehicle strike

during early evening/night/early morning when Proserpine Rock-wallabies are active. Proserpine Rock-wallabies may cross Proserpine - Shute Harbour Road to the west of the site monitoring for additional impacts and or crossing points based on strike data and nocturnal survey, in conjunction with / or to an agreed QPWS methodology is necessary. Should impacts be identified, amelioration in the form of a night time reduction in speed limits, wildlife crossing signs and reflective devices (Nolan and Johnson 2001), audible rumble strips or introduction of traffic calming devices (raised traffic platforms, series of speed humps) at the approaches to identified crossing points.

Implementation of reduced speed limits may also reduce the potential for road mortalities of rufous owl *Ninox rufa queenslandica* that may occur in the wider locality. In the absence of known mortality hot-spots, the recommended strategy is reduced speed signage for sunset to sunrise, placement of reflectors at predicted crossing sites with ongoing monitoring being considered with the aforementioned traffic calming devises retrofitted if hot-spots are identified post-development.

4.7.5 Pests

No exotic fauna pests were detected during the assessment. However species that are likely to be present in the area include house mouse *Mus musculus,* black rat *Rattus rattus* and feral cat *Felis cattus.* It is likely that these fauna would reside in newly created development and could become problematic in the absence of adequate site management. However contemporary refuse management and pest control strategies are adequate in keeping such populations under control. Further, cat's associated with visiting yachts may become stray and problematic. Therefore regular pest monitoring and control should become a feature of construction and ongoing management of the development, with adherence to Whitsunday Shire's *Feral and Stray Cat Management Plan* (WSC 2006) where necessary to control stray and feral cats on the site.

The black rat *Rattus rattus* and feral cat *Felis cattus* could become resident in the edges of adjoining remnant habitat if the above measures are not implemented. Domesticated pets have the potential to become feral if they escape or are abandoned. Therefore pets should be discouraged from the marina complex, and a nightly curfew enforced.

The buffer areas of the site to the north of Proserpine – Whitsunday Road will remain undeveloped. There are no plans to fence this area or provide pedestrian access tracks. Therefore the risk of anthropogenic traffic in this area resulting in the introduction and establishment of pests is low.

The introduction of invertebrate and vertebrate pests through movement of earth moving and construction equipment is a significant issue for any project adjoins National Parks and World Heritage Areas. All earthmoving equipment and construction materials arriving at the site must be certified clean of soil and pest material (washed down prior to arriving at the site) and inspected by the site environmental officer. Additional certification compliant with movement notices may be required if materials, equipment and machinery have come from a declared pest area. All vehicles arriving at the site dirty, or only partially clean should be denied entry.

4.7.6 Noise and Lighting Impacts

Previous development proposals have proposed quarrying the rock to the north of Proserpine – Shute Harbour Road. This is not a feature of this proposal, as fill material will be imported. No blasting is proposed.

Noise and lighting associated with the developments can initially affect the behavior of animals using the areas as habitat. However, when these impacts become familiar, many animals adapt to the intrusions, and can even turn intrusions such as permanent light to their advantage (eg micro-chiropteran bats hunting insects around flood lighting). However most animals are unlikely to habituate to a situation whereby they would cross Proserpine - Shute Harbour Road in the vicinity of the site and in this sense the additional lighting would deter animals from the road.

The width of retained vegetation within the corridor should obscure most lighting impacts so animals are unlikely to be affected. The positioning of lighting to ameliorate nuisance light emissions, the reduction of lighting to the minimum output necessary (low lux bulbs), yellow frequency and fitting lights with shrouds or diffusers will also greatly assist in minimising potential light effects on both marine and terrestrial habitats.

Lights that attract nesting turtles and hatchlings are likely to contribute to increased mortality. Excessive lighting impacts on gravid female marine turtles as they move towards rookery site to lay eggs are well known and understood. Sources of light that affect marine turtle orientation include street lights, coastal marina developments, and boats moored at sea and in harbours and marina.

For this reason shielded and directed and low lux lighting is used around rookery sites where development occurs nearby. This ameliorates the disorientating effects lighting has. All un-necessary lighting will be switched off and timers used with some forms of lighting around the development to reduce the overall cumulative effect. For the proposed development, this is not likely to be an issue as there are no known rookery sites located nearby.

The proximity of the proposed development to areas retained for conservation is relevant from a noise perspective as the auditory sensitivity of some mammals (eg, horses) is greater than that of humans. In particular, some mammals are more sensitive to high pitched sound than humans. Although low levels of noise are generally well tolerated if the noise is familiar (eg, the existing traffic noise), short loud noises (> 90 dB(A) typically) can result in startle effects. The potential for startle effects and high frequency noise emissions could be considered a potential risk to the fauna population of nearby conservation habitats.

In terms of the risk of impacts, continuous plant noise sources and those with fairly consistent patterns of noise are likely to have little impact on the conservation habitat. However, processes or activities with a potential to cause short, random, high level instantaneous noise sources should be located such that noise levels at the boundary of the buffer areas to the north of Proserpine – Shute Harbour Road do not exceed 90 dB(A). Such activities are generally associated with manufacturing, and as none are proposed for the marina, this is unlikely to be an issue.

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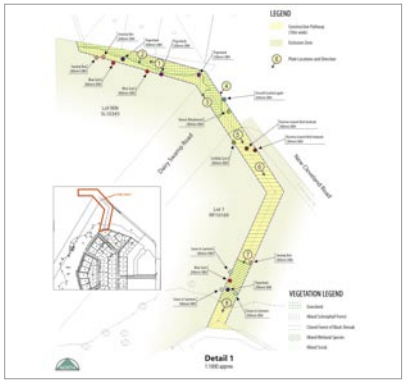
APPENDIX A

Curricula Vitae of Study Personnel

WAYNE MOFFITT

PLACE
DESIGN GROUP

DIRECTOR - ENVIRONMENT
BSC (AES) MEIA



Wayne Moffitt is a Director of PLACE Design Group, and the Manager of PLACE Environmental. With over 10 years experience as an environmental manager and ecologist in Queensland, Wayne is very familiar with the unique qualities of this region, its complex land management issues and the regulatory framework that affords it protection. Wayne has led assessments in a wide range of environments and development settings, and has significant expertise in the assessment of linear infrastructure..

EXPERIENCE

2004 – Current
Director - Environement
PLACE Design Group

2000 – 2004
Manager - Environment
PLACE Planning & Design

1997 – 2000
Senior Environmental Scientist
James Warren & Associates

1995 – 1997
Environmental Scientist
AGC Woodward Clyde

1993 – 1995
Town Planning Assistant
Ian Pickles Town Planning & Northern Rivers Engineers Planners and Scientists

EDUCATION

Bachelor of Science
(Australian Environmental Studies)
Griffith University

AFFILIATIONS

› Member Environmental Institute of Australia

EXPERTISE

› Project Management
› Baseline Ecological Assessment
› Development Opportunity Appraisal
› Vegetation Management Plans
› Species Impact Statements
› Local Environmental Studies
› Environmental Impact Statements
› Decision Mediation and Appeal
› Legislative Compliance (NSW & QLD)
› EPBC Referral
› Statements of Evidence
› Expert Witness

CLIENTS

› Phillips Fox Lawyers
› Corrs Chambers Westgarth
› Trenches Solicitors
› Resource Strategies
› Australasian Resource Consultants
› The BMD Group
› Mirvac
› QM Properties
› Lend Lease
› Lensworth
› Heritage Pacific
› Newton Denny Chapelle
› Keilar Fox McGhie
› Norris Clarke & O'Brien
› Byron Shire Council
› Lismore City Council
› Brisbane City Council

PROJECTS

› Bundjalung National Park
› Stradbroke Island Beach Hotel Appeal
› Cooray Urban Release Area Appeal
› Springbrook Ecoresort Appeal
› Skinners Quarry Appeal
› Cadia Hill Gold
› Duralie Coal
› Timbarra Gold Mine

PROJECTS (cont.)

› Ravenswood Gold
› Acland Coal Mine
› Lady Loretta Mine
› Bungawalbyn Hardrock Quarry
› Pacifi c Harbour Golf Course
› Mt Warning Ecolodge
› Illaweena Street
› Hindes Steet Lota
› Cutters Landing
› Dairy Swamp Road
› Mossvale

AREAS OF PRACTICE

› Project management of ecological assessment programs
› Preparation of Statements of Evidence for the Planning & Environment Court
› Preparation of Ecological Assessment Reports addressing Commonwealth, New South Wales and Queensland Environmental Planning legislation
› Vegetation & Habitat Management Plans
› Local Environmental Plans
› Shire-wide environmental assessment and planning studies
› Stakeholder negotiation
› Community consultation
› Recreation Management Plans
› Local Government secondment

ANDREW DICKINSON

PLACE
DESIGN GROUP

ENVIRONMENT MANAGER (BRISBANE)
SENIOR ECOLOGIST - ENVIRONMENTAL SCIENTIST

B SC. (AUSTRALIAN ENVIRONMENTAL STUDIES)
GRAD CERT ENVIRONMENTAL MANAGEMENT

Andrew Dickinson is the Brisbane Manager of PLACE Environmental. He is an Ecologist and Environmental Scientist with over over 15 years consulting experience in Queensland, New South Wales, Victoria, Northern Territory and New Caledoina. He has broad experience in terrestrial and aquatic resource assessment, weed and pest assessment, rehabilitation and revegetation, threatened species assessment, ecological planning, ecological monitoring, flora and fauna superintenting (spotter-catcher and vegetation removal), flora and fauna management planning and impact assessment servicing a variety of sectors including industry, minining, linear corridors (roads, rail, power and service corridors), telecommunications, urban development, government and NGOs.

Andrew has particular project experience in South Eastern and Central Queensland and Northern New South Wales having conducted assessments in a variety of Australian ecosystems and biogeographic regions. He has regularly designed, managed and implimented a range of baseline ecological assessments and impact studies to meet regulatory requirements of Local, State and Commonwealth Governments.

EXPERIENCE

2006 - Current
Queensland Environment Manager
Senior Ecologist - Environmental Scientist
PLACE Environmental

2004 - 2006
Natural Resources Group Qld Regional Manager
Senior Ecologist - Environmental Scientist
URS Pty Ltd

2004
Senior Ecologist - Environmental Scientist
Earth Tech Engineering Pty Ltd

1999 - 2004
Senior Ecologist - Environmental Scientist
URS Pty Ltd

1997 - 1999
Senior Ecologist - Environmental Scientist
Dames & Moore Pty Ltd

1992 - 1997
Senior Environmental Scientist
HLA (Harding Lawson Associates) - Enviroscienses Pty Ltd, Brisbane

1992
Consultant Environmental Scientist
Self employed

1990 - 1991
Project Environmental Scientist
Sinclair Knight Pty Ltd, Brisbane

EDUCATION

Bachelor of Science (Australian Environmental Studies), Griffith University

Graduate Certificate of Environmental Management, Griffith University

SHORT COURSES

- Remnant Vegetation Management Training Course (NRM October 2000)
- Regional Ecosystem Identification & Interpretation training course (EPA March 1999).
- Environmental Monitoring and Testing for the Mining Industry (Centre for Mined Land Rehabilitation, University of Queensland May 1997)

AFFILIATIONS

- Member, Environment Institute of Australia and New Zealand (MEIANZ)
- Member, Ecological Society of Australia

EXPERTISE

- Terrestrial and Aquatic Ecological/Biological Studies
- Environmental Planning
- Species Management Plans
- Environmental Impact Assessment
- Pre-clearing Koala/Fauna Survey's and Superintending
- Environmental Impact Assessment
- Rehabilitation and Revegetation
- Weed and Pest Management
- Visual Assessment
- EPBC Assessment
- Ecological Monitoring
- Project Management

SELECTED PROJECTS

› PROJECT MANAGEMENT

- North East Business Park
- Nikenbah Powerline IAR
- Shute Harbour Marina

› ENVIRONMENTAL ADVICE AND SCREENING STUDIES

- Rosslyn Bay Ecological Assessment
- Burdekin River Dam Hydro
- Proposed Rail Siding, Archerfield

› IMPACT ASSESSMENTS

- LG Chem Plan EIS
- Australian Magnesium Project EIS
- Comalco Alumina Project

› WEED & PEST MANAGEMENT

- Chinchilla Parthenium Weed Assessment
- Charters Towers Declared Weed Assessment
- Gladstone Environmental Weed Assessment

› FAUNA ASSESSMENTS

- Enoggera Close Training Area
- Duaringa Weir EIS
- Forgan Bridge Targeted Species Assessment

› AQUATIC ASSESSMENTS

- Duaringa Weir EIS
- Sefton Park and Glen Wilga EIS
- CAP Additional Aquatic Studies

› VEGETATION ASSESSMENTS

- QR Larapinta
- Amberley RAAF Base
- South Walker Mine Vegetation Assessment

SELECTED PROJECTS cont.

› VEGETATION MANAGEMENT

- Phosphate Hill Mine
- Vegetation Management Plans - residential sub-divisions in Brisbane City, Logan City, Pine Rivers Shire and Caboolture Shire.

› REGIONAL ECOSYSTEM MANAGEMENT

- Comalco Alumina Refinery
- Theodore Road

› MINING ASSESSMENTS

- Mt Arthur North EIS - Flora & Fauna Assessment
- Broadmeadow Vegetation Management Strategy
- Mooranbah South and Grosvenor Mine Leases - River Ecological Assessment

› REHABILITATION & REVEGETATION

- St Connel Street Subdivision
- Kedron – Wavell Hockey Field
- South Walker Mine

› MANAGEMENT PLANS

- QR Larapinta
- Fauna Management Plans – residential and industrial developments in SEQ.
- Wet Tropics Operations Management Plans – North Queensland, for Telstra
- Spotter Catcher – Fauna Management (pre-clear assessment and spotter catcher) at over 50 sites in Caboolture, Pine Rivers, Logan City, Gold Coast and Redland Local Government Areas.

› EPBC ASSESSMENT

- CAP Red Mud Disposal Area
- Telecommunications Facilities, Telstra

CHRIS HANSEN

PLACE
DESIGN GROUP

BOTANIST / ECOLOGIST
B.BIOMEDSC, B.SC(HONS)

Chris has worked for a number of years as a bush regenerator on a wide variety of rehabilitation projects from revegetation of completely cleared areas to weed removal in otherwise intact vegetation communities. This work encompassed a wide variety of vegetation types and has given Chris strong plant identification skills. He has also compiled a significant personal herbarium collection numbering in excess of 1200 reference specimens. His identification skills in combination with his rehabilitation experience and his current studies give him an excellent understanding of botanical issues. He has undertaken numerous botanical surveys of proposed development sites throughout Queensland and NSW.

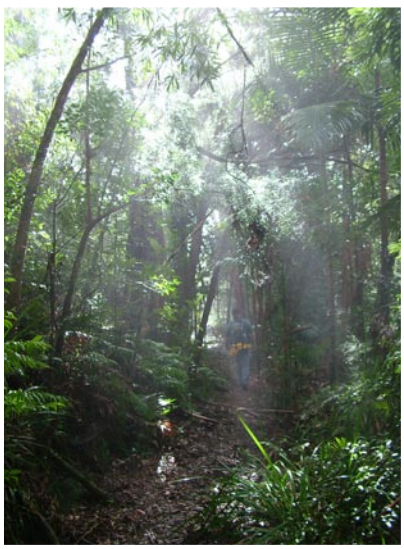
EXPERIENCE

2004 – Current
Botanist / Ecologist
PLACE Design Group

2004 – Current
Proprietor / Director
Hansen Vegetation Management

1999, 2001 – 2003
Bushland Regenerator
Native Flora Services T/A Rainforest Repairs

1995 – 1999
Honours Student, PhD Student
Queensland Institute of Medical Research



EDUCATION

Bachelor of Biomedical Science
Griffith University

Postgraduate Bachelor of Science (Honours)
University of Queensland

Regional Ecosystem Acreditation
QLD Herbarium

Chainsaw Operator Certificate 1

Agriculture Chemicals Distribution Control Operators Certificate

Senior First Aid Certificate (St John's Ambulance)

EQUIPMENT EXPERIENCE

- Differential GPS Technology; Clinometer
- Bush Regeneration including herbicide application using, spray-packs and dispensing equipment, chainsaw, brushcutter (blade and cord), self propelled slasher
- Fauna Trapping Techniques (Pitfall, Elliot and Arboreal Glider Trapping)
- Arbor - Climbing (ascent climbs, rigging)

EXPERTISE

- Report Writing (botanical inventories, vegetation management plans, ecological assessments, literature reviews\ searches)
- Methodologies (RE Mapping, crown intercept determination, plot based quadrat surveys)

PROFESSIONAL DEVELOPMENT

- *Qui L, Kelso MJ,* ***Hansen C****, West ML, Fairlie DP, Parsons PG.*
  "Anti-tumour activity in vitro and in vivo of selective differentiating agents containing hydroxamate."
  Br J Cancer, (1999) 80(8): 1252-8
- *Parsons PG,* ***Hansen C****, Fairlie DP, West ML, Danoy PA, Sturm RA, Dunn IS, Pedley J, Ablett EM.*
  "Tumour selectivity and transcriptional activation by azelaic bishydroxamic acid in human melanocytic cells."
  Biochem Pharmacol (1997)53(11):1719-24
- ***Hansen C****, Ablett E, Green A, Sturm RA, Dunn IS, Fairlie DP, West ML, Parsons PG.*
  "Biphasic response of the metallothionein promoter to ultraviolet radiation in human melanoma cells."
  Photochem Photobiol (1997) 65(3): 550-5

PROJECTS

- Ballina Quarry
- Agnes Waters Desalination Project
- Humpybonk Creek CMP
- Birdwing Environmental Centre
- Kingsholme Valley Masterplan
- Mongogarie Chicken Shed EIS
- Genesis Residentail Development
- Kunioon MDL
- Gold Coast Desalination Project
- Greenbank - Ebernezer Transmission Project
- Noosa Hospital Upgrade
- Hinze Dam FSL Investigation
- Tarong Transport Alliance
- Shute Harbour Marina
- Caloundra Coastal Walk
- Rothwell Park Masterplan
- Thornlands Masterplanned Community
- Radius Industrial Development
- Lismore City Council Road Upgrades
- Acacia Ridge Substation Project
- Sanctuary on Moggill Residential Development
- Kawana Golf Course Development

CARL CORDEN

PLACE
DESIGN GROUP

ECOLOGIST
B.ENV MAN (NATURAL SYSTEMS & WILDLIFE)

Following a life long interest in zoology and after 10 years in Educational Administration Carl completed a Bachelor of Environmental Management (Natural Systems and Wildlife) with the University of Queensland. He then worked with the Queensland National Parks and Wildlife Services on several threatened species recovery programs, before joining PLACE Environmental in 2003. Carl has carried out terrestrial flora and vertebrate fauna surveys on numerous sites in Southeast Queensland and Northern NSW and has developed specific skills in vertebrate fauna survey and management and GPS survey techniques. Carl also has an appreciation for the complexity of environmental planning and impact assessment pertinent to the development industry, and has assisted with the preparation of ecological assessment reports, waterway assessments, vegetation management plans and other supporting materials.

EXPERIENCE

2003 – Current
Ecologist
PLACE Environmental

2002
Technical/Research Officer
Eastern Bristlebird Recovery Program
Queensland Parks & Wildlife Services

2000 – 2002
Project Offi cer
Faculty of Biological and Chemical Sciences
The University of Queensland

1997 – 2000
Administrative Officer
Faculty of Social and Behavioural Sciences
The University of Queensland

1997 – 2000
Office Manager
Head of Studies Unit
Illawarra Institute of Technology

EDUCATION

Bachelor of Environmental Management (Natural Systems and Wildlife), The University of Queensland

Senior First Aid Certificate (St John's Ambulance)

EXPERTISE

- Environmental Impact Assessment & Management
- Ecological Assessment Reporting
- Wildlife Ecology and Management
- Vegetation Management Plans
- Baseline Flora and Fauna Surveys
- Threatened Species Management

AREAS OF PRACTICE

- Baseline fl ora and fauna assessment, contraint analysis and technical reporting (ecological assessment reports)
- Pre-clearing fauna survey and fauna rescue programs
- Vegetation & Habitat Management Plans
- Radio telemetry and home range analysis
- Development assessment advice and approval planning under Queensland Integrated Planning Act 1997, State Planning Policies, EPA and Local Planning instruments
- Preparation of Impact Assessment reports in accordance with Commonwealth, State and Local Government Nature Conservation Legislation and Policy

CLIENTS

- Resource Strategies
- Keilar Fox & McGhie
- The BMD Group
- Mirvac
- QM Properties
- Heritage Pacific
- MCD Australia
- Oxmar Properties
- Newton Denny Chapelle
- Norris Clarke & OBrien
- Lismore City Council

PROJECTS

- Timbarra Gold Mine Threatened Species Monitoring
- Ecological Assessment of the proposed Goodna Substation
- Pacific Harbour Golf Course - Vegetation Management Plan
- Proposed Curtis Island Resort - Ecological Assessment
- Eastern Bristlebird Recovery Plan - Radio telemetry, monintoring and home range analysis
- Various ecological assessments and Vegetation Management Plans for numerous property developments in South East Queensland
- Ginkgo Mine Fauna Management Program
- Palmview Investigation Area (Investa) Ecological Assessment
- Caloundra City Council - Coastal Walkway Environmental Assessment
- Ningi Wallum Froglet Monitoring Program
- Ernest Henry Mine Water Quality Monitoring Program

APPENDIX B

Database Searches

APPENDIX B.1

WildNet Database Search Results

Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service

Wildlife Online Extract

Search Criteria:	Species List for a Specified Point
	Species: All
	Status: All
	Date: Since 1980
	Latitude: 20.28883
	Longitude: 148.779248
	Distance: 5
	Email: adickinson@placedesigngroup.com
	Date submitted: Thursday 15 Feb 2007 15:58:22
	Date extracted: Thursday 15 Feb 2007 16:16:03

The number of records retrieved = 517

Kingdom	Class	Family	Scientific Name	Common Name	NCA	EPBC	Recs
animals	amphibians	Bufonidae	*Bufo marinus*	cane toad		.	6
animals	amphibians	Hylidae	*Litoria fallax*	eastern sedgefrog	C	.	1
animals	amphibians	Hylidae	*Litoria bicolor*	northern sedgefrog	C	.	1
animals	amphibians	Hylidae	*Litoria chloris*	orange eyed treefrog	C	.	3
animals	amphibians	Hylidae	*Litoria rubella*	ruddy treefrog	C	.	2
animals	amphibians	Hylidae	*Litoria lesueuri sensu lato*	stony creek frog	C	.	5
animals	amphibians	Hylidae	*Litoria gracilenta*	graceful treefrog	C	.	2
animals	amphibians	Hylidae	*Litoria caerulea*	common green treefrog	C	.	6
animals	amphibians	Myobatrachidae	*Limnodynastes peronii*	striped marshfrog	C	.	2
animals	amphibians	Myobatrachidae	*Mixophyes fasciolatus*	great barred frog	C	.	1
animals	birds	Accipitridae	*Haliaeetus leucogaster*	white-bellied sea-eagle	C	.	22
animals	birds	Accipitridae	*Aquila audax*	wedge-tailed eagle	C	.	8
animals	birds	Accipitridae	*Milvus migrans*	black kite	C	.	1
animals	birds	Accipitridae	*Hieraaetus morphnoides*	little eagle	C	.	1
animals	birds	Accipitridae	*Accipiter novaehollandiae*	grey goshawk	R	.	1
animals	birds	Accipitridae	*Haliastur indus*	brahminy kite	C	.	28
animals	birds	Accipitridae	*Accipiter fasciatus*	brown goshawk	C	.	3
animals	birds	Accipitridae	*Aviceda subcristata*	Pacific baza	C	.	3
animals	birds	Accipitridae	*Pandion haliaetus*	osprey	C	.	37
animals	birds	Alcedinidae	*Alcedo azurea*	azure kingfisher	C	.	3
animals	birds	Alcedinidae	*Alcedo pusilla*	little kingfisher	C	.	1
animals	birds	Anatidae	*Anas superciliosa*	Pacific black duck	C	.	4
animals	birds	Anatidae	*Chenonetta jubata*	Australian wood duck	C	.	1
animals	birds	Anhingidae	*Anhinga melanogaster*	darter	C	.	3
animals	birds	Apodidae	*Hirundapus caudacutus*	white-throated needletail	C	.	2
animals	birds	Ardeidae	*Egretta garzetta*	little egret	C	.	2
animals	birds	Ardeidae	*Egretta novaehollandiae*	white-faced heron	C	.	2
animals	birds	Ardeidae	*Nycticorax caledonicus*	nankeen night heron	C	.	3
animals	birds	Ardeidae	*Butorides striatus*	striated heron	C	.	10
animals	birds	Ardeidae	*Ardea intermedia*	intermediate egret	C	.	3
animals	birds	Ardeidae	*Egretta sacra*	eastern reef egret	C	.	26
animals	birds	Ardeidae	*Ardea alba*	great egret	C	.	4
animals	birds	Artamidae	*Cracticus quoyi*	black butcherbird	C	.	21
animals	birds	Artamidae	*Cracticus torquatus*	grey butcherbird	C	.	2
animals	birds	Artamidae	*Strepera graculina*	pied currawong	C	.	7
animals	birds	Artamidae	*Artamus leucorynchus*	white-breasted woodswallow	C	.	16
animals	birds	Artamidae	*Cracticus nigrogularis*	pied butcherbird	C	.	1
animals	birds	Artamidae	*Cracticus quoyi rufescens*	black butcherbird (coastal north-central Queensland))		.	1
animals	birds	Artamidae	*Artamus superciliosus*	white-browed woodswallow	C	.	1
animals	birds	Burhinidae	*Esacus neglectus*	beach stone-curlew	V	.	7
animals	birds	Burhinidae	*Burhinus grallarius*	bush stone-curlew	C	.	11
animals	birds	Cacatuidae	*Cacatua galerita*	sulphur-crested cockatoo	C	.	33
animals	birds	Cacatuidae	*Calyptorhynchus banksii*	red-tailed black-cockatoo	C	.	1
animals	birds	Campephagidae	*Lalage leucomela*	varied triller	C	.	21
animals	birds	Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike	C	.	6

Kingdom	Class	Family	Scientific Name	Common Name	NCA	EPBC	Recs
animals	birds	Campephagidae	*Coracina tenuirostris*	cicadabird	C	.	1
animals	birds	Campephagidae	*Coracina papuensis*	white-bellied cuckoo-shrike	C	.	2
animals	birds	Caprimulgidae	*Caprimulgus macrurus*	large-tailed nightjar	C	.	1
animals	birds	Centropodidae	*Centropus phasianinus*	pheasant coucal	C	.	12
animals	birds	Charadriidae	*Vanellus miles*	masked lapwing	C	.	1
animals	birds	Charadriidae	*Vanellus miles miles*	masked lapwing (northern subspecies)	C	.	3
animals	birds	Ciconiidae	*Ephippiorhynchus asiaticus*	black-necked stork	R	.	1
animals	birds	Columbidae	*Columba livia*	rock dove		.	1
animals	birds	Columbidae	*Geopelia humeralis*	bar-shouldered dove	C	.	13
animals	birds	Columbidae	*Ptilinopus magnificus*	wompoo fruit-dove	C	.	6
animals	birds	Columbidae	*Macropygia amboinensis*	brown cuckoo-dove	C	.	11
animals	birds	Columbidae	*Ptilinopus superbus*	superb fruit-dove	C	.	4
animals	birds	Columbidae	*Chalcophaps indica*	emerald dove	C	.	13
animals	birds	Columbidae	*Ducula bicolor*	pied imperial-pigeon	C	.	19
animals	birds	Columbidae	*Geopelia striata*	peaceful dove	C	.	16
animals	birds	Columbidae	*Ptilinopus regina*	rose-crowned fruit-dove	C	.	10
animals	birds	Columbidae	*Columba leucomela*	white-headed pigeon	C	.	1
animals	birds	Coraciidae	*Eurystomus orientalis*	dollarbird	C	.	1
animals	birds	Corvidae	*Corvus orru*	Torresian crow	C	.	13
animals	birds	Cuculidae	*Eudynamys scolopacea*	common koel	C	.	6
animals	birds	Cuculidae	*Scythrops novaehollandiae*	channel-billed cuckoo	C	.	2
animals	birds	Cuculidae	*Chrysococcyx minutillus*	little bronze-cuckoo	C	.	6
animals	birds	Cuculidae	*Cacomantis flabelliformis*	fan-tailed cuckoo	C	.	2
animals	birds	Dicaeidae	*Dicaeum hirundinaceum*	mistletoebird	C	.	14
animals	birds	Dicruridae	*Myiagra alecto*	shining flycatcher	C	.	2
animals	birds	Dicruridae	*Dicrurus bracteatus*	spangled drongo	C	.	16
animals	birds	Dicruridae	*Monarcha melanopsis*	black-faced monarch	C	.	2
animals	birds	Dicruridae	*Monarcha trivirgatus*	spectacled monarch	C	.	26
animals	birds	Dicruridae	*Dicrurus bracteatus bracteatus*	spangled drongo (eastern Australia)	C	.	2
animals	birds	Dicruridae	*Rhipidura leucophrys*	willie wagtail	C	.	2
animals	birds	Dicruridae	*Rhipidura fuliginosa*	grey fantail	C	.	14
animals	birds	Dicruridae	*Rhipidura rufifrons*	rufous fantail	C	.	12
animals	birds	Dicruridae	*Grallina cyanoleuca*	magpie-lark	C	.	9
animals	birds	Dicruridae	*Monarcha leucotis*	white-eared monarch	C	.	4
animals	birds	Dicruridae	*Myiagra rubecula*	leaden flycatcher	C	.	15
animals	birds	Falconidae	*Falco peregrinus*	peregrine falcon	C	.	3
animals	birds	Falconidae	*Falco cenchroides*	nankeen kestrel	C	.	1
animals	birds	Haematopodidae	*Haematopus fuliginosus*	sooty oystercatcher	R	.	8
animals	birds	Haematopodidae	*Haematopus longirostris*	pied oystercatcher	C	.	13
animals	birds	Halcyonidae	*Dacelo leachii*	blue-winged kookaburra	C	.	2
animals	birds	Halcyonidae	*Todiramphus sanctus*	sacred kingfisher	C	.	6
animals	birds	Halcyonidae	*Todiramphus macleayii*	forest kingfisher	C	.	1
animals	birds	Halcyonidae	*Todiramphus chloris*	collared kingfisher	C	.	7
animals	birds	Halcyonidae	*Tanysiptera sylvia*	buff-breasted paradise-kingfisher	C	.	5
animals	birds	Halcyonidae	*Dacelo novaeguineae*	laughing kookaburra	C	.	14

Kingdom	Class	Family	Scientific Name	Common Name	NCA	EPBC	Recs
animals	birds	Hirundinidae	*Hirundo neoxena*	welcome swallow	C	.	21
animals	birds	Laridae	*Sterna bergii*	crested tern	C	.	23
animals	birds	Laridae	*Larus novaehollandiae*	silver gull	C	.	54
animals	birds	Laridae	*Sterna bengalensis*	lesser crested tern	C	.	7
animals	birds	Laridae	*Sterna sumatrana*	black-naped tern	C	.	4
animals	birds	Laridae	*Sterna anaethetus*	bridled tern	C	.	1
animals	birds	Megapodiidae	*Alectura lathami*	Australian brush-turkey	C	.	20
animals	birds	Megapodiidae	*Megapodius reinwardt*	orange-footed scrubfowl	C	.	12
animals	birds	Meliphagidae	*Myzomela obscura*	dusky honeyeater	C	.	20
animals	birds	Meliphagidae	*Philemon buceroides*	helmeted friarbird	C	.	15
animals	birds	Meliphagidae	*Lichmera indistincta*	brown honeyeater	C	.	1
animals	birds	Meliphagidae	*Myzomela sanguinolenta*	scarlet honeyeater	C	.	2
animals	birds	Meliphagidae	*Lichenostomus fasciogularis*	mangrove honeyeater	C	.	6
animals	birds	Meliphagidae	*Acanthorhynchus tenuirostris*	eastern spinebill	C	.	1
animals	birds	Meliphagidae	*Melithreptus albogularis*	white-throated honeyeater	C	.	13
animals	birds	Meliphagidae	*Philemon corniculatus*	noisy friarbird	C	.	2
animals	birds	Meliphagidae	*Lichenostomus flavus*	yellow honeyeater	C	.	3
animals	birds	Meliphagidae	*Meliphaga lewinii*	Lewin's honeyeater	C	.	29
animals	birds	Meliphagidae	*Entomyzon cyanotis*	blue-faced honeyeater	C	.	2
animals	birds	Meropidae	*Merops ornatus*	rainbow bee-eater	C	.	12
animals	birds	Nectariniidae	*Nectarinia jugularis*	yellow-bellied sunbird	C	.	17
animals	birds	Oriolidae	*Oriolus sagittatus*	olive-backed oriole	C	.	6
animals	birds	Oriolidae	*Sphecotheres viridis*	figbird	C	.	22
animals	birds	Pachycephalidae	*Pachycephala melanura*	mangrove golden whistler	C	.	2
animals	birds	Pachycephalidae	*Colluricincla megarhyncha*	little shrike-thrush	C	.	16
animals	birds	Pachycephalidae	*Colluricincla harmonica*	grey shrike-thrush	C	.	1
animals	birds	Pachycephalidae	*Pachycephala rufiventris*	rufous whistler	C	.	6
animals	birds	Pardalotidae	*Gerygone mouki*	brown gerygone	C	.	2
animals	birds	Pardalotidae	*Sericornis magnirostris*	large-billed scrubwren	C	.	2
animals	birds	Pardalotidae	*Gerygone magnirostris*	large-billed gerygone	C	.	4
animals	birds	Pardalotidae	*Gerygone palpebrosa*	fairy gerygone	C	.	9
animals	birds	Pardalotidae	*Acanthiza reguloides*	buff-rumped thornbill	C	.	1
animals	birds	Pardalotidae	*Sericornis frontalis*	white-browed scrubwren	C	.	7
animals	birds	Pardalotidae	*Gerygone levigaster*	mangrove gerygone	C	.	3
animals	birds	Passeridae	*Passer domesticus*	house sparrow		.	3
animals	birds	Passeridae	*Lonchura punctulata*	nutmeg mannikin		.	4
animals	birds	Passeridae	*Lonchura castaneothorax*	chestnut-breasted mannikin	C	.	3
animals	birds	Pelecanidae	*Pelecanus conspicillatus*	Australian pelican	C	.	10
animals	birds	Petroicidae	*Eopsaltria australis*	eastern yellow robin	C	.	7
animals	birds	Phalacrocoracidae	*Phalacrocorax varius*	pied cormorant	C	.	22
animals	birds	Phalacrocoracidae	*Phalacrocorax sulcirostris*	little black cormorant	C	.	4
animals	birds	Phasianidae	*Pavo cristatus*	Indian peafowl		.	1
animals	birds	Pittidae	*Pitta versicolor*	noisy pitta	C	.	3
animals	birds	Podargidae	*Podargus strigoides*	tawny frogmouth	C	.	2
animals	birds	Psittacidae	*Glossopsitta pusilla*	little lorikeet	C	.	1

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animals	birds	Psittacidae	*Trichoglossus chlorolepidotus*	scaly-breasted lorikeet	C	.	2
animals	birds	Psittacidae	*Trichoglossus haematodus moluccanus*	rainbow lorikeet	C	.	19
animals	birds	Psittacidae	*Platycercus adscitus palliceps*	pale-headed rosella (southern form)	C	.	1
animals	birds	Psittacidae	*Platycercus adscitus*	pale-headed rosella	C	.	3
animals	birds	Rallidae	*Porphyrio porphyrio*	purple swamphen	C	.	1
animals	birds	Rallidae	*Gallirallus philippensis*	buff-banded rail	C	.	2
animals	birds	Scolopacidae	*Xenus cinereus*	terek sandpiper	C	.	1
animals	birds	Scolopacidae	*Numenius madagascariensis*	eastern curlew	R	.	3
animals	birds	Scolopacidae	*Heteroscelus brevipes*	grey-tailed tattler	C	.	4
animals	birds	Scolopacidae	*Limosa lapponica*	bar-tailed godwit	C	.	1
animals	birds	Scolopacidae	*Actitis hypoleucos*	common sandpiper	C	.	1
animals	birds	Scolopacidae	*Numenius phaeopus*	whimbrel	C	.	8
animals	birds	Strigidae	*Ninox novaeseelandiae*	southern boobook	C	.	2
animals	birds	Strigidae	*Ninox rufa queenslandica*	rufous owl (southern subspecies)	V	.	1
animals	birds	Sturnidae	*Aplonis metallica*	metallic starling	C	.	7
animals	birds	Sturnidae	*Acridotheres tristis*	common myna		.	1
animals	birds	Sylviidae	*Cisticola exilis*	golden-headed cisticola	C	.	2
animals	birds	Sylviidae	*Megalurus timoriensis*	tawny grassbird	C	.	3
animals	birds	Threskiornithidae	*Threskiornis molucca*	Australian white ibis	C	.	3
animals	birds	Tytonidae	*Tyto alba*	barn owl	C	.	1
animals	birds	Zosteropidae	*Zosterops lateralis*	silvereye	C	.	7
animals	birds	Zosteropidae	*Zosterops lateralis cornwalli*	silvereye (eastern)	C	.	2
animals	insects	Hesperiidae	*Tagiades japetus janetta*	pied flat		.	3
animals	insects	Lycaenidae	*Arhopala madytus*	bright oak-blue		.	1
animals	insects	Lycaenidae	*Prosotas dubiosa dubiosa*	small purple line-blue		.	1
animals	insects	Lycaenidae	*Hypolycaena phorbas phorbas*	black-spotted flash		.	1
animals	insects	Lycaenidae	*Nacaduba berenice berenice*	large purple line-blue		.	1
animals	insects	Lycaenidae	*Candalides erinus erinus*	small dusky-blue		.	1
animals	insects	Lycaenidae	*Rapala varuna simsoni*	indigo flash		.	1
animals	insects	Lycaenidae	*Candalides hyacinthina*			.	1
animals	insects	Lycaenidae	*Arhopala micale amphis*	shining oak-blue (southern subspecies)		.	1
animals	insects	Nymphalidae	*Hypocysta irius*	orange-streaked ringlet		.	2
animals	insects	Nymphalidae	*Hypolimnas bolina nerina*	varied eggfly		.	2
animals	insects	Nymphalidae	*Pantoporia consimilis consimilis*	orange plane		.	3
animals	insects	Nymphalidae	*Doleschallia bisaltide australis*	leafwing		.	2
animals	insects	Nymphalidae	*Mycalesis terminus terminus*	orange bush-brown		.	2
animals	insects	Nymphalidae	*Euploea tulliolus tulliolus*	purple crow		.	2
animals	insects	Nymphalidae	*Euploea sylvester sylvester*	two-brand crow		.	1
animals	insects	Nymphalidae	*Danaus plexippus plexippus*	monarch		.	1
animals	insects	Nymphalidae	*Hypolimnas alimena lamina*	blue-banded eggfly		.	1
animals	insects	Nymphalidae	*Tirumala hamata hamata*	blue tiger		.	3
animals	insects	Nymphalidae	*Euploea core corinna*	common crow		.	1
animals	insects	Nymphalidae	*Melanitis leda bankia*	common evening-brown		.	2
animals	insects	Nymphalidae	*Cupha prosope prosope*	bordered rustic (Australian subspecies)		.	2
animals	insects	Papilionidae	*Papilio aegeus aegeus*	orchard swallowtail (Australian subspecies)		.	1

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animals	insects	Papilionidae	*Papilio fuscus capaneus*	fuscous swallowtail (Australian subspecies)		.	1
animals	insects	Papilionidae	*Cressida cressida cressida*	greasy swallowtail		.	1
animals	insects	Papilionidae	*Papilio ulysses joesa*	Ulysses butterfly	C	.	1
animals	insects	Pieridae	*Delias mysis mysis*	red-banded jezebel (Queensland subspecies)		.	1
animals	insects	Pieridae	*Catopsilia pomona pomona*	lemon migrant		.	1
animals	insects	Pieridae	*Eurema hecabe phoebus*	large grass-yellow		.	2
animals	mammals	Bovidae	*Capra hircus*	goat		.	2
animals	mammals	Canidae	*Canis familiaris*	dog		.	3
animals	mammals	Dasyuridae	*Planigale maculata*	common planigale	C	.	10
animals	mammals	Dasyuridae	*Dasyurus hallucatus*	northern quoll	C	E	3
animals	mammals	Felidae	*Felis catus*	cat		.	2
animals	mammals	Macropodidae	*Macropus agilis*	agile wallaby	C	.	2
animals	mammals	Macropodidae	*Thylogale stigmatica*	red-legged pademelon	C	.	2
animals	mammals	Macropodidae	*Petrogale persephone*	Proserpine rock-wallaby	E	E	44
animals	mammals	Macropodidae	*Wallabia bicolor*	swamp wallaby	C	.	8
animals	mammals	Molossidae	*Nyctinomus australis*			.	1
animals	mammals	Muridae	*Rattus rattus*	black rat		.	2
animals	mammals	Muridae	*Melomys burtoni*	grassland melomys	C	.	2
animals	mammals	Muridae	*Rattus fuscipes*	bush rat	C	.	1
animals	mammals	Muridae	*Melomys cervinipes*	fawn-footed melomys	C	.	16
animals	mammals	Muridae	*Hydromys chrysogaster*	water rat	C	.	4
animals	mammals	Peramelidae	*Perameles nasuta*	long-nosed bandicoot	C	.	2
animals	mammals	Peramelidae	*Isoodon macrourus*	northern brown bandicoot	C	.	6
animals	mammals	Petauridae	*Petaurus norfolcensis*	squirrel glider	C	.	5
animals	mammals	Phalangeridae	*Trichosurus vulpecula*	common brushtail possum	C	.	10
animals	mammals	Pseudocheiridae	*Pseudocheirus peregrinus*	common ringtail possum	C	.	4
animals	mammals	Pteropodidae	*Pteropus alecto*	black flying-fox	C	.	4
animals	mammals	Pteropodidae	*Nyctimene robinsoni*	eastern tube-nosed bat	C	.	7
animals	mammals	Pteropodidae	*Pteropus scapulatus*	little red flying-fox	C	.	1
animals	mammals	Pteropodidae	*Syconycteris australis*	eastern blossom bat	C	.	1
animals	mammals	Tachyglossidae	*Tachyglossus aculeatus*	short-beaked echidna	C	.	6
animals	mammals	Vespertilionidae	*Vespadelus troughtoni*	eastern cave bat	C	.	6
animals	mammals	Vespertilionidae	*Nyctophilus bifax bifax*	northern long-eared bat	C	.	6
animals	reptiles	Agamidae	*Diporiphora australis*		C	.	2
animals	reptiles	Agamidae	*Physignathus lesueurii*	eastern water dragon	C	.	1
animals	reptiles	Boidae	*Morelia spilota*	carpet python	C	.	5
animals	reptiles	Boidae	*Antaresia maculosa*		C	.	1
animals	reptiles	Boidae	*Antaresia childreni*	children's python	C	.	3
animals	reptiles	Cheloniidae	*Chelonia mydas*	green turtle	V	V	1
animals	reptiles	Colubridae	*Boiga irregularis*	brown tree snake	C	.	2
animals	reptiles	Colubridae	*Dendrelaphis punctulata*	common tree snake	C	.	3
animals	reptiles	Elapidae	*Demansia torquata*	collared whip snake	C	.	1
animals	reptiles	Elapidae	*Cacophis harriettae*	white-crowned snake	C	.	1
animals	reptiles	Elapidae	*Demansia vestigiata*	black whip snake	C	.	1
animals	reptiles	Elapidae	*Pseudechis porphyriacus*	red-bellied black snake	C	.	4

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animals	reptiles	Elapidae	*Rhinoplocephalus nigrescens*	eastern small-eyed snake	C	.	1
animals	reptiles	Gekkonidae	*Gehyra dubia*		C	.	2
animals	reptiles	Gekkonidae	*Oedura monilis*		C	.	1
animals	reptiles	Gekkonidae	*Oedura rhombifer*	zig-zag gecko	C	.	4
animals	reptiles	Gekkonidae	*Hemidactylus frenatus*	house gecko		.	3
animals	reptiles	Gekkonidae	*Heteronotia binoei*	Bynoe's gecko	C	.	2
animals	reptiles	Gekkonidae	*Oedura ocellata*		C	.	1
animals	reptiles	Pygopodidae	*Delma tincta*		C	.	1
animals	reptiles	Pygopodidae	*Lialis burtonis*	Burton's legless lizard	C	.	1
animals	reptiles	Scincidae	*Carlia sp.*			.	1
animals	reptiles	Scincidae	*Egernia major*	land mullet	C	.	1
animals	reptiles	Scincidae	*Carlia foliorum*		C	.	1
animals	reptiles	Scincidae	*Eulamprus amplus*		R	.	2
animals	reptiles	Scincidae	*Eulamprus tenuis*		C	.	6
animals	reptiles	Scincidae	*Carlia pectoralis*		C	.	2
animals	reptiles	Scincidae	*Carlia schmeltzii*		C	.	3
animals	reptiles	Scincidae	*Ctenotus robustus*		C	.	1
animals	reptiles	Scincidae	*Ctenotus eutaenius*		C	.	1
animals	reptiles	Scincidae	*Carlia rhomboidalis*		C	.	5
animals	reptiles	Scincidae	*Lampropholis adonis*		C	.	8
animals	reptiles	Scincidae	*Lampropholis delicata*		C	.	2
animals	reptiles	Scincidae	*Saproscincus hannahae*		C	.	9
animals	reptiles	Scincidae	*Saproscincus basiliscus*		C	.	1
animals	reptiles	Scincidae	*Cryptoblepharus virgatus*		C	.	3
animals	reptiles	Scincidae	*Cyclodomorphus gerrardii*	pink-tongued lizard	C	.	1
animals	reptiles	Scincidae	*Cryptoblepharus litoralis*		C	.	8
animals	reptiles	Scincidae	*Glaphyromorphus punctulatus*		C	.	1
animals	reptiles	Varanidae	*Varanus varius*	lace monitor	C	.	6
fungi	sac fungi	Haematommaceae	*Haematomma africanum*		C	.	7
fungi		Basidiomycota	*Auricularia delicata*		C	.	1
fungi		Basidiomycota	*Tyromyces grammocephalus*		C	.	1
plants	ferns	Adiantaceae	*Adiantum diaphanum*		C	.	1
plants	ferns	Adiantaceae	*Adiantum hispidulum var. hispidulum*		C	.	1
plants	ferns	Adiantaceae	*Doryopteris concolor*		C	.	1
plants	ferns	Adiantaceae	*Adiantum hispidulum var. minus*		C	.	1
plants	ferns	Adiantaceae	*Cheilanthes tenuifolia*	rock fern	C	.	2
plants	ferns	Aspleniaceae	*Asplenium paleaceum*	scaly asplenium	C	.	2
plants	ferns	Blechnaceae	*Doodia media*		C	.	1
plants	ferns	Dennstaedtiaceae	*Pteridium esculentum*	common bracken	C	.	1
plants	ferns	Dryopteridaceae	*Lastreopsis tenera*		C	.	2
plants	ferns	Dryopteridaceae	*Lastreopsis rufescens*		C	.	2
plants	ferns	Dryopteridaceae	*Coveniella poecilophlebia*		C	.	1
plants	ferns	Hymenophyllaceae	*Crepidomanes bipunctatum*		C	.	2
plants	ferns	Hymenophyllaceae	*Crepidomanes saxifragoides*		C	.	1
plants	ferns	Nephrolepidaceae	*Nephrolepis hirsutula*		C	.	1

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plants	ferns	Polypodiaceae	*Drynaria rigidula*		C	.	1
plants	ferns	Polypodiaceae	*Microsorum punctatum*		C	.	1
plants	ferns	Pteridaceae	*Pteris ensiformis*	slender bracken	C	.	1
plants	ferns	Thelypteridaceae	*Thelypteridaceae*		C	.	1
plants	ferns	Vittariaceae	*Vittaria ensiformis*		C	.	1
plants	higher dicots	Acanthaceae	*Rostellularia*		C	.	1
plants	higher dicots	Acanthaceae	*Harnieria hygrophiloides*	white karambal	C	.	3
plants	higher dicots	Acanthaceae	*Rostellularia adscendens subsp. dallachyi*		C	.	1
plants	higher dicots	Alangiaceae	*Alangium villosum subsp. tomentosum*		C	.	1
plants	higher dicots	Amaranthaceae	*Deeringia amaranthoides*	redberry	C	.	1
plants	higher dicots	Anacardiaceae	*Pleiogynium timorense*	Burdekin plum	C	.	3
plants	higher dicots	Anacardiaceae	*Euroschinus falcatus var. falcatus*		C	.	2
plants	higher dicots	Apocynaceae	*Parsonsia rotata*	veinless silkpod	C	.	1
plants	higher dicots	Apocynaceae	*Alyxia ruscifolia*		C	.	1
plants	higher dicots	Apocynaceae	*Alstonia scholaris*	white cheesewood	C	.	2
plants	higher dicots	Apocynaceae	*Ochrosia elliptica*	northern ochrosia	C	.	2
plants	higher dicots	Apocynaceae	*Parsonsia velutina*	hairy silkpod	C	.	1
plants	higher dicots	Apocynaceae	*Alyxia spicata*		C	.	1
plants	higher dicots	Apocynaceae	*Melodinus australis*	southern melodinus	C	.	1
plants	higher dicots	Apocynaceae	*Parsonsia plaesiophylla*		C	.	2
plants	higher dicots	Apocynaceae	*Parsonsia longipetiolata*		C	.	1
plants	higher dicots	Apocynaceae	*Tabernaemontana orientalis*		C	.	2
plants	higher dicots	Araliaceae	*Polyscias elegans*	celery wood	C	.	2
plants	higher dicots	Araliaceae	*Mackinlaya macrosciadea*	mackinlaya	C	.	1
plants	higher dicots	Asclepiadaceae	*Cynanchum carnosum*		C	.	1
plants	higher dicots	Asclepiadaceae	*Marsdenia tricholepis*		C	.	2
plants	higher dicots	Asclepiadaceae	*Heterostemma acuminatum*		C	.	1
plants	higher dicots	Asclepiadaceae	*Marsdenia micradenia*	gymnema	C	.	1
plants	higher dicots	Asclepiadaceae	*Tylophora benthamii*	coast tylophora	C	.	1
plants	higher dicots	Asteraceae	*Youngia japonica*		C	.	1
plants	higher dicots	Asteraceae	*Synedrella nodiflora*			.	1
plants	higher dicots	Asteraceae	*Sphagneticola trilobata*			.	1
plants	higher dicots	Asteraceae	*Bidens alba var. radiata*			.	1
plants	higher dicots	Asteraceae	*Cyanthillium cinereum*		C	.	1
plants	higher dicots	Asteraceae	*Calyptocarpus vialis*	creeping cinderella weed		.	1
plants	higher dicots	Bignoniaceae	*Pandorea pandorana*	wonga vine	C	.	1
plants	higher dicots	Bignoniaceae	*Spathodea campanulata*	West African tulip tree		.	1
plants	higher dicots	Bignoniaceae	*Pandorea jasminoides*		C	.	1
plants	higher dicots	Boraginaceae	*Cordia aspera*		C	.	2
plants	higher dicots	Boraginaceae	*Heliotropium sarmentosum*		C	.	1
plants	higher dicots	Boraginaceae	*Cordia dichotoma*		C	.	1
plants	higher dicots	Caesalpiniaceae	*Intsia bijuga*		C	.	1
plants	higher dicots	Caesalpiniaceae	*Cynometra iripa*		C	.	1
plants	higher dicots	Caesalpiniaceae	*Cassia fistula*	Indian laburnum		.	1
plants	higher dicots	Celastraceae	*Celastrus subspicata*	large-leaved staffvine	C	.	3

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plants	higher dicots	Celastraceae	*Elaeodendron melanocarpum*		C	.	2
plants	higher dicots	Combretaceae	*Terminalia*		C	.	1
plants	higher dicots	Combretaceae	*Macropteranthes fitzalanii*		R	.	7
plants	higher dicots	Connaraceae	*Rourea brachyandra*		R	.	1
plants	higher dicots	Convolvulaceae	*Argyreia nervosa*			.	1
plants	higher dicots	Convolvulaceae	*Ipomoea macrantha*		C	.	1
plants	higher dicots	Cucurbitaceae	*Momordica charantia*	balsam pear		.	1
plants	higher dicots	Cucurbitaceae	*Diplocyclos palmatus subsp. palmatus*		C	.	2
plants	higher dicots	Cucurbitaceae	*Neoalsomitra clavigera*		C	.	1
plants	higher dicots	Ebenaceae	*Diospyros ferrea*		C	.	1
plants	higher dicots	Ebenaceae	*Diospyros geminata*	scaly ebony	C	.	1
plants	higher dicots	Ebenaceae	*Diospyros compacta*		C	.	4
plants	higher dicots	Ebenaceae	*Diospyros cupulosa*		C	.	1
plants	higher dicots	Ebenaceae	*Diospyros hebecarpa*		C	.	2
plants	higher dicots	Elaeocarpaceae	*Elaeocarpus obovatus*	blueberry ash	C	.	2
plants	higher dicots	Epacridaceae	*Acrotriche aggregata*	red cluster heath	C	.	4
plants	higher dicots	Euphorbiaceae	*Chamaesyce petala*		C	.	1
plants	higher dicots	Euphorbiaceae	*Drypetes deplanchei*	grey boxwood	C	.	1
plants	higher dicots	Euphorbiaceae	*Sauropus albiflorus*	snowbush	C	.	1
plants	higher dicots	Euphorbiaceae	*Antidesma parvifolium*		C	.	2
plants	higher dicots	Euphorbiaceae	*Glochidion lobocarpum*		C	.	2
plants	higher dicots	Euphorbiaceae	*Flueggea virosa subsp. melanthesoides*		C	.	1
plants	higher dicots	Euphorbiaceae	*Phyllanthus novae-hollandiae*		C	.	1
plants	higher dicots	Euphorbiaceae	*Cleistanthus dallachyanus*		C	.	1
plants	higher dicots	Euphorbiaceae	*Claoxylon angustifolium*		C	.	5
plants	higher dicots	Euphorbiaceae	*Bridelia leichhardtii*		C	.	1
plants	higher dicots	Euphorbiaceae	*Breynia oblongifolia*		C	.	1
plants	higher dicots	Euphorbiaceae	*Mallotus nesophilus*		C	.	1
plants	higher dicots	Euphorbiaceae	*Cleidion javanicum*		C	.	3
plants	higher dicots	Euphorbiaceae	*Croton arnhemicus*		C	.	2
plants	higher dicots	Fabaceae	*Tephrosia*		C	.	1
plants	higher dicots	Fabaceae	*Derris trifoliata*		C	.	1
plants	higher dicots	Fabaceae	*Flemingia lineata*		C	.	2
plants	higher dicots	Fabaceae	*Canavalia papuana*	wild jack bean	C	.	1
plants	higher dicots	Fabaceae	*Centrosema molle*			.	1
plants	higher dicots	Fabaceae	*Glycine cyrtoloba*		C	.	1
plants	higher dicots	Fabaceae	*Flemingia parviflora*	flemingia	C	.	2
plants	higher dicots	Fabaceae	*Tephrosia sp. (Copperfield River P.I.Forster PIF14768)*		C	.	1
plants	higher dicots	Fabaceae	*Dendrolobium umbellatum var. umbellatum*		C	.	1
plants	higher dicots	Fabaceae	*Tephrosia brachyodon var. brachyodon*		C	.	3
plants	higher dicots	Fabaceae	*Austrosteenisia blackii var. blackii*		C	.	1
plants	higher dicots	Fabaceae	*Sophora tomentosa subsp. australis*		C	.	1
plants	higher dicots	Fabaceae	*Rhynchosia acuminatissima*		C	.	2
plants	higher dicots	Fabaceae	*Erythrina vespertilio*		C	.	1
plants	higher dicots	Fabaceae	*Millettia pinnata*		C	.	1

Kingdom	Class	Family	Scientific Name	Common Name	NCA	EPBC	Recs
plants	higher dicots	Flacourtiaceae	*Homalium sp. (South Molle Island J.A.Gresty AQ208995)*		C	.	2
plants	higher dicots	Lamiaceae	*Vitex acuminata*		C	.	1
plants	higher dicots	Lamiaceae	*Vitex melicopea*		C	.	3
plants	higher dicots	Lamiaceae	*Premna dallachyana*		C	.	2
plants	higher dicots	Lamiaceae	*Leucas decemdentata*		C	.	1
plants	higher dicots	Lamiaceae	*Vitex trifolia var. trifolia*		C	.	1
plants	higher dicots	Lamiaceae	*Plectranthus diversus*		C	.	1
plants	higher dicots	Lecythidaceae	*Planchonia careya*	cockatoo apple	C	.	1
plants	higher dicots	Leeaceae	*Leea indica*	bandicoot berry	C	.	1
plants	higher dicots	Malvaceae	*Hibiscus heterophyllus*		C	.	1
plants	higher dicots	Melastomataceae	*Memecylon pauciflorum var. pauciflorum*		C	.	3
plants	higher dicots	Meliaceae	*Dysoxylum rufum*		C	.	1
plants	higher dicots	Meliaceae	*Dysoxylum klanderi*		C	.	1
plants	higher dicots	Meliaceae	*Dysoxylum alliaceum*		C	.	1
plants	higher dicots	Meliaceae	*Turraea pubescens*	native honeysuckle	C	.	3
plants	higher dicots	Mimosaceae	*Acacia decora*	pretty wattle	C	.	2
plants	higher dicots	Mimosaceae	*Acacia flavescens*	toothed wattle	C	.	2
plants	higher dicots	Mimosaceae	*Acacia leptocarpa*	north coast wattle	C	.	1
plants	higher dicots	Mimosaceae	*Acacia multisiliqua*		C	.	1
plants	higher dicots	Mimosaceae	*Acacia spirorbis subsp. solandri*		C	.	4
plants	higher dicots	Mimosaceae	*Mimosa pudica var. unijuga*			.	1
plants	higher dicots	Mimosaceae	*Acacia maidenii*	Maiden's wattle	C	.	1
plants	higher dicots	Mimosaceae	*Acacia simsii*		C	.	1
plants	higher dicots	Moraceae	*Ficus septica*		C	.	2
plants	higher dicots	Moraceae	*Ficus virens var. sublanceolata*		C	.	1
plants	higher dicots	Moraceae	*Ficus microcarpa var. hillii*		C	.	1
plants	higher dicots	Moraceae	*Maclura cochinchinensis*	cockspur thorn	C	.	1
plants	higher dicots	Myrtaceae	*Gossia bidwillii*		C	.	3
plants	higher dicots	Myrtaceae	*Eucalyptus drepanophylla*		C	.	3
plants	higher dicots	Myrtaceae	*Acmenosperma claviflorum*	grey satinash	C	.	1
plants	higher dicots	Myrtaceae	*Austromyrtus bidwillii*	python tree	C	.	1
plants	higher dicots	Myrtaceae	*Lophostemon confertus*	brush box	C	.	1
plants	higher dicots	Myrtaceae	*Eugenia reinwardtiana*	beach cherry	C	.	3
plants	higher dicots	Myrtaceae	*Eucalyptus portuensis*		C	.	8
plants	higher dicots	Myrtaceae	*Syzygium johnsonii*	Johnson's satinash	C	.	1
plants	higher dicots	Myrtaceae	*Corymbia intermedia*	pink bloodwood	C	.	3
plants	higher dicots	Myrtaceae	*Gossia pubiflora*		C	.	4
plants	higher dicots	Myrtaceae	*Corymbia dallachiana*		C	.	1
plants	higher dicots	Nyctaginaceae	*Boerhavia mutabilis*		C	.	1
plants	higher dicots	Oleaceae	*Jasminum simplicifolium*		C	.	1
plants	higher dicots	Oleaceae	*Jasminum didymum subsp. racemosum*		C	.	1
plants	higher dicots	Passifloraceae	*Passiflora suberosa*	corky passion flower		.	2
plants	higher dicots	Pittosporaceae	*Bursaria incana*		C	.	4
plants	higher dicots	Pittosporaceae	*Bursaria tenuifolia*		C	.	1
plants	higher dicots	Pittosporaceae	*Auranticarpa rhombifolia*		C	.	1

Kingdom	Class	Family	Scientific Name	Common Name	NCA	EPBC	Recs
plants	higher dicots	Pittosporaceae	*Bursaria spinosa subsp. spinosa*		C	.	1
plants	higher dicots	Proteaceae	*Banksia integrifolia subsp. compar*		C	.	1
plants	higher dicots	Rhamnaceae	*Alphitonia incana*		C	.	1
plants	higher dicots	Rhamnaceae	*Emmenosperma alphitonioides*	yellow ash	C	.	1
plants	higher dicots	Rhamnaceae	*Alphitonia sp. (Little Crystal Creek A.R.Bean 5237)*		C	.	1
plants	higher dicots	Rhamnaceae	*Ventilago ecorollata*		C	.	1
plants	higher dicots	Rhamnaceae	*Alphitonia excelsa*	soap tree	C	.	2
plants	higher dicots	Rhamnaceae	*Colubrina asiatica*		C	.	2
plants	higher dicots	Rhizophoraceae	*Carallia brachiata*	carallia	C	.	1
plants	higher dicots	Rubiaceae	*Canthium*		C	.	1
plants	higher dicots	Rubiaceae	*Timonius timon var. timon*		C	.	2
plants	higher dicots	Rubiaceae	*Tarenna dallachiana subsp. dallachiana*		C	.	1
plants	higher dicots	Rubiaceae	*Gen.(Aq520454) sp. (Shute Harbour D.A.Halford Q811)*		C	.	4
plants	higher dicots	Rubiaceae	*Psychotria sp. (Shute Harbour L.J.Webb+ 7916)*		C	.	1
plants	higher dicots	Rubiaceae	*Atractocarpus fitzalanii subsp. fitzalanii*		C	.	2
plants	higher dicots	Rubiaceae	*Caelospermum paniculatum var. paniculatum*		C	.	1
plants	higher dicots	Rubiaceae	*Psychotria daphnoides var. daphnoides*		C	.	1
plants	higher dicots	Rubiaceae	*Pogonolobus reticulatus*		C	.	1
plants	higher dicots	Rubiaceae	*Aidia racemosa*		C	.	2
plants	higher dicots	Rubiaceae	*Ixora timorensis*		C	.	6
plants	higher dicots	Rubiaceae	*Larsenaikia jardinei*		C	.	5
plants	higher dicots	Rubiaceae	*Antirhea tenuiflora*		C	.	1
plants	higher dicots	Rubiaceae	*Psychotria*		C	.	1
plants	higher dicots	Rutaceae	*Acronychia laevis*	glossy acronychia	C	.	1
plants	higher dicots	Rutaceae	*Murraya ovatifoliolata*		C	.	3
plants	higher dicots	Rutaceae	*Flindersia schottiana*	bumpy ash	C	.	1
plants	higher dicots	Rutaceae	*Geijera salicifolia*	brush wilga	C	.	2
plants	higher dicots	Rutaceae	*Zanthoxylum nitidum*		C	.	1
plants	higher dicots	Rutaceae	*Glycosmis trifoliata*		C	.	1
plants	higher dicots	Sapindaceae	*Atalaya rigida*		R	.	2
plants	higher dicots	Sapindaceae	*Guioa lasioneura*		C	.	1
plants	higher dicots	Sapindaceae	*Harpullia hillii*		C	.	1
plants	higher dicots	Sapindaceae	*Jagera pseudorhus*		C	.	1
plants	higher dicots	Sapindaceae	*Alectryon connatus*	grey birds-eye	C	.	1
plants	higher dicots	Sapindaceae	*Ganophyllum falcatum*		C	.	1
plants	higher dicots	Sapindaceae	*Mischocarpus anodontus*	veiny pearfruit	C	.	1
plants	higher dicots	Sapindaceae	*Cupaniopsis wadsworthii*		C	.	1
plants	higher dicots	Sapindaceae	*Cardiospermum grandiflorum*	heart seed vine		.	2
plants	higher dicots	Sapindaceae	*Dodonaea lanceolata var. lanceolata*		C	.	1
plants	higher dicots	Sapotaceae	*Pouteria chartacea*	thin-leaved coondoo	C	.	1
plants	higher dicots	Sapotaceae	*Pouteria cotinifolia var. cotinifolia*		C	.	1
plants	higher dicots	Simaroubaceae	*Brucea javanica*		C	.	2
plants	higher dicots	Simaroubaceae	*Ailanthus triphysa*	white siris	C	.	1
plants	higher dicots	Solanaceae	*Lycianthes shanesii*		C	.	1
plants	higher dicots	Solanaceae	*Solanum sporadotrichum*		R	.	1

Kingdom	Class	Family	Scientific Name	Common Name	NCA	EPBC	Recs
plants	higher dicots	Sterculiaceae	*Argyrodendron polyandrum*	brown tulip oak	C	.	2
plants	higher dicots	Sterculiaceae	*Brachychiton acerifolius*	flame tree	C	.	1
plants	higher dicots	Tiliaceae	*Grewia australis*		C	.	1
plants	higher dicots	Tiliaceae	*Corchorus olitorius*	jute	C	.	1
plants	higher dicots	Ulmaceae	*Aphananthe philippinensis*		C	.	2
plants	higher dicots	Ulmaceae	*Celtis philippensis var. philippensis*		C	.	1
plants	higher dicots	Violaceae	*Hybanthus stellarioides*		C	.	1
plants	higher dicots	Vitaceae	*Cissus opaca*		C	.	1
plants	higher dicots	Vitaceae	*Cissus repens*		C	.	1
plants	higher dicots	Vitaceae	*Cissus hastata*		C	.	3
plants	higher dicots	Vitaceae	*Cissus oblonga*		C	.	1
plants	higher dicots	Vitaceae	*Tetrastigma thorsborneorum*		C	.	2
plants	lower dicots	Annonaceae	*Miliusa brahei*		C	.	1
plants	lower dicots	Annonaceae	*Melodorum leichhardtii*		C	.	2
plants	lower dicots	Annonaceae	*Fitzalania heteropetala*		C	.	1
plants	lower dicots	Aristolochiaceae	*Aristolochia*		C	.	1
plants	lower dicots	Hernandiaceae	*Gyrocarpus americanus subsp. americanus*		C	.	1
plants	lower dicots	Lauraceae	*Neolitsea brassii*		C	.	1
plants	lower dicots	Lauraceae	*Beilschmiedia obtusifolia*	hard bolly gum	C	.	1
plants	lower dicots	Lauraceae	*Cryptocarya triplinervis var. pubens*		C	.	1
plants	lower dicots	Lauraceae	*Cryptocarya triplinervis*		C	.	1
plants	lower dicots	Lauraceae	*Cassytha filiformis*	dodder laurel	C	.	1
plants	lower dicots	Lauraceae	*Litsea fawcettiana*		C	.	2
plants	lower dicots	Menispermaceae	*Pachygone ovata*		C	.	1
plants	lower dicots	Menispermaceae	*Hypserpa laurina*		C	.	1
plants	lower dicots	Piperaceae	*Piper interruptum*		C	.	2
plants	monocots	Amaryllidaceae	*Crinum pedunculatum*	river lily	C	.	1
plants	monocots	Amaryllidaceae	*Proiphys infundibularis*		C	.	1
plants	monocots	Araceae	*Alocasia brisbanensis*		C	.	1
plants	monocots	Commelinaceae	*Aneilema acuminatum*		C	.	1
plants	monocots	Cyperaceae	*Scleria lithosperma var. linearis*		C	.	3
plants	monocots	Cyperaceae	*Cyperus enervis*		C	.	4
plants	monocots	Cyperaceae	*Schoenus sparteus*		C	.	1
plants	monocots	Cyperaceae	*Cyperus dietrichiae*		C	.	1
plants	monocots	Cyperaceae	*Cyperus perangustus*		C	.	1
plants	monocots	Cyperaceae	*Scleria sphacelata*		C	.	4
plants	monocots	Cyperaceae	*Cyperus cyperinus*		C	.	1
plants	monocots	Cyperaceae	*Gahnia aspera*		C	.	2
plants	monocots	Orchidaceae	*Nervilia plicata*		C	.	1
plants	monocots	Orchidaceae	*Corymborkis veratrifolia*	cinnamon orchid	C	.	1
plants	monocots	Poaceae	*Paspalidium*		C	.	1
plants	monocots	Poaceae	*Aristida spuria*		C	.	2
plants	monocots	Poaceae	*Eriachne pallescens var. pallescens*		C	.	1
plants	monocots	Poaceae	*Mnesithea rottboellioides*		C	.	2
plants	monocots	Poaceae	*Ancistrachne uncinulata*	hooky grass	C	.	2

Kingdom	Class	Family	Scientific Name	Common Name	NCA	EPBC	Recs
plants	monocots	Poaceae	*Panicum subxerophilum*	gilgai grass	C	.	1
plants	monocots	Poaceae	*Oplismenus compositus*		C	.	3
plants	monocots	Poaceae	*Heteropogon triticeus*	giant speargrass	C	.	1
plants	monocots	Poaceae	*Oplismenus burmannii*		C	.	1
plants	monocots	Poaceae	*Digitaria parviflora*		C	.	1
plants	monocots	Poaceae	*Bothriochloa pertusa*			.	1
plants	monocots	Poaceae	*Oplismenus undulatifolius var. mollis*		C	.	1
plants	monocots	Poaceae	*Melinis minutiflora*	molasses grass		.	1
plants	monocots	Poaceae	*Eriachne pallescens*		C	.	1
plants	monocots	Poaceae	*Cymbopogon obtectus*		C	.	2
plants	monocots	Poaceae	*Cymbopogon ambiguus*	lemon grass	C	.	1
plants	monocots	Poaceae	*Panicum mitchellii*		C	.	1
plants	monocots	Poaceae	*Oplismenus aemulus*	creeping shade grass	C	.	1
plants	monocots	Poaceae	*Chrysopogon fallax*		C	.	1
plants	monocots	Poaceae	*Themeda triandra*	kangaroo grass	C	.	1
plants	monocots	Poaceae	*Panicum simile*		C	.	2
plants	monocots	Smilacaceae	*Smilax australis*	barbed-wire vine	C	.	1
plants	monocots	Xanthorrhoeaceae	*Xanthorrhoea*		C	.	2
plants		Hemerocallidaceae	*Dianella caerulea*		C	.	1
plants		Laxmanniaceae	*Lomandra longifolia*		C	.	2
plants		Laxmanniaceae	*Eustrephus latifolius*	wombat berry	C	.	1
plants		Laxmanniaceae	*Lomandra multiflora subsp. multiflora*		C	.	1

CODES

NCA - Indicates the conservation status of each taxon under the *Nature Conservation Act 1992.*
The codes are Presumed Extinct (PE), Endangered (E), Vulnerable (V), Rare (R), Common (C) or Not Protected ( ).

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

Recs - Indicates the number of records of the species contained within the database for the area searched.

APPENDIX B.2

Commonwealth Protected Matters Database
Search Results

Australian Government
Department of the Environment and Water Resources

Protected Matters Search Tool

You are here: Environment Home > EPBC Act > Search

15 February 2007 16:41

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.

You may wish to print this report for reference before moving to other pages or websites.

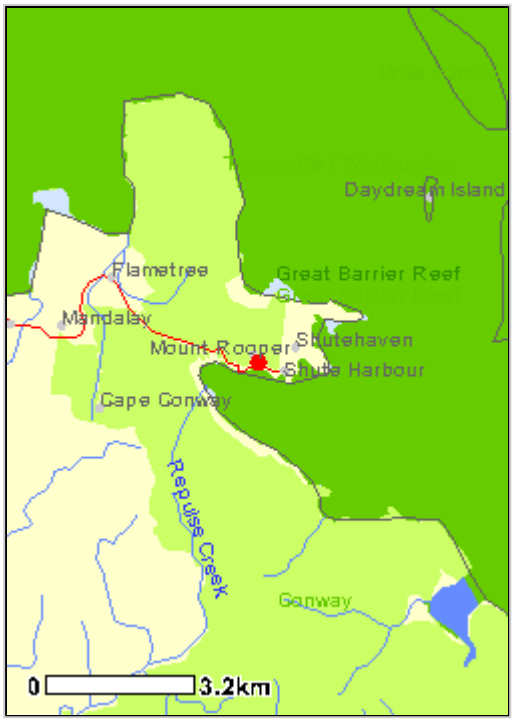
The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

Search Type: Point
Buffer: 5 km
Coordinates: -20.28883,148.779248

Report Contents:

Summary
Details
- Matters of NES
- Other matters protected by the EPBC Act
- Extra Information

Caveat
Acknowledgments



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 - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	1
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	None
Commonwealth Marine Areas:	Relevant
Threatened Ecological Communities:	None
Threatened Species:	22
Migratory Species:	27

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 and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

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. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Places on the RNE:	2
Listed Marine Species:	73
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves:	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:	3
Other Commonwealth Reserves:	1
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

World Heritage Properties [Dataset Information]

Great Barrier Reef QLD

Commonwealth Marine Areas [Dataset Information]

Approval may be required for a proposed activity that is likely to have a significant impact on the environment in a Commonwealth Marine Area, when the action is outside the Commonwealth Marine Area, or the environment anywhere when the action is taken within the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Within 3 Nautical Mile Limit

Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Erythrotriorchis radiatus * Red Goshawk	Vulnerable	Species or species habitat likely to occur within area
*Geophaps scripta scripta** Squatter Pigeon (southern)	Vulnerable	Species or species habitat likely to occur within area
Macronectes giganteus * Southern Giant-Petrel	Endangered	Species or species habitat may occur within area
*Pterodroma neglecta neglecta** Kermadec Petrel (western)	Vulnerable	Species or species habitat may occur within area
Rostratula australis * Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus * Blue Whale	Endangered	Species or species habitat may occur within area
Dasyurus hallucatus * Northern Quoll	Endangered	Species or species habitat may occur within area
Megaptera novaeangliae * Humpback Whale	Vulnerable	Congregation or aggregation known to occur within area
Petrogale persephone * Proserpine Rock-wallaby	Endangered	Species or species habitat likely to occur within area
Pteropus conspicillatus * Spectacled Flying-fox	Vulnerable	Species or species habitat may occur within area

Xeromys myoides * Water Mouse, False Water Rat	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta * Loggerhead Turtle	Endangered	Species or species habitat may occur within area
Chelonia mydas * Green Turtle	Vulnerable	Species or species habitat may occur within area
Delma labialis * Striped-tailed Delma	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea * Leathery Turtle, Leatherback Turtle, Luth	Vulnerable	Species or species habitat may occur within area
Egernia rugosa * Yakka Skink	Vulnerable	Species or species habitat likely to occur within area
Eretmochelys imbricata * Hawksbill Turtle	Vulnerable	Species or species habitat may occur within area
Lepidochelys olivacea * Pacific Ridley, Olive Ridley	Endangered	Species or species habitat may occur within area
Natator depressus * Flatback Turtle	Vulnerable	Breeding likely to occur within area
Sharks		
Rhincodon typus * Whale Shark	Vulnerable	Species or species habitat may occur within area
Plants		
Leucopogon cuspidatus *	Vulnerable	Species or species habitat likely to occur within area
Ozothamnus eriocephalus *	Vulnerable	Species or species habitat likely to occur within area
Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Hirundo rustica Barn Swallow	Migratory	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch	Migratory	Breeding may occur within area
Monarcha trivirgatus Spectacled Monarch	Migratory	Breeding likely to occur within area
Myiagra cyanoleuca Satin Flycatcher	Migratory	Species or species habitat likely to occur within area
Migratory Wetland Species		
Birds		

Gallinago hardwickii Latham's Snipe, Japanese Snipe	Migratory	Species or species habitat may occur within area
Nettapus coromandelianus albipennis Australian Cotton Pygmy-goose	Migratory	Species or species habitat may occur within area
Numenius minutus Little Curlew, Little Whimbrel	Migratory	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may occur within area
Migratory Marine Birds		
Macronectes giganteus Southern Giant-Petrel	Migratory	Species or species habitat may occur within area
Migratory Marine Species		
Mammals		
Balaenoptera edeni Bryde's Whale	Migratory	Species or species habitat may occur within area
Balaenoptera musculus ***** Blue Whale	Migratory	Species or species habitat may occur within area
Dugong dugon Dugong	Migratory	Species or species habitat likely to occur within area
Megaptera novaeangliae ***** Humpback Whale	Migratory	Congregation or aggregation known to occur within area
Orcaella brevirostris Irrawaddy Dolphin	Migratory	Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca	Migratory	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin	Migratory	Species or species habitat may occur within area
Reptiles		
Caretta caretta ***** Loggerhead Turtle	Migratory	Species or species habitat may occur within area
Chelonia mydas ***** Green Turtle	Migratory	Species or species habitat may occur within area
Crocodylus porosus Estuarine Crocodile, Salt-water Crocodile	Migratory	Species or species habitat likely to occur within area
Dermochelys coriacea ***** Leathery Turtle, Leatherback Turtle, Luth	Migratory	Species or species habitat may occur within area
Eretmochelys imbricata ***** Hawksbill Turtle	Migratory	Species or species habitat may occur within area
Lepidochelys olivacea ***** Pacific Ridley, Olive Ridley	Migratory	Species or species habitat may occur within area
Natator depressus ***** Flatback Turtle	Migratory	Breeding likely to occur within area
Sharks		
Rhincodon typus Whale Shark	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Anseranas semipalmata Magpie Goose	Listed - overfly marine area	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area
Hirundo rustica Barn Swallow	Listed - overfly marine area	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel	Listed	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch	Listed - overfly marine area	Breeding may occur within area
Monarcha trivirgatus Spectacled Monarch	Listed - overfly marine area	Breeding likely to occur within area
Myiagra cyanoleuca Satin Flycatcher	Listed - overfly marine area	Species or species habitat likely to occur within area
Nettapus coromandelianus albipennis	Listed -	Species or species habitat may occur

Australian Cotton Pygmy-goose	overfly marine area	within area
Numenius minutus Little Curlew, Little Whimbrel	Listed - overfly marine area	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Sterna albifrons Little Tern	Listed	Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong	Listed	Species or species habitat likely to occur within area
Ray-finned fishes		
Acentronura tentaculata Hairy Pygmy Pipehorse	Listed	Species or species habitat may occur within area
Campichthys tryoni Tryon's Pipefish	Listed	Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish	Listed	Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish	Listed	Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish	Listed	Species or species habitat may occur within area
Corythoichthys flavofasciatus Yellow-banded Pipefish, Network Pipefish	Listed	Species or species habitat may occur within area
Corythoichthys intestinalis Australian Messmate Pipefish, Banded Pipefish	Listed	Species or species habitat may occur within area
Corythoichthys ocellatus Orange-spotted Pipefish, Ocellated Pipefish	Listed	Species or species habitat may occur within area
Corythoichthys paxtoni Paxton's Pipefish	Listed	Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish	Listed	Species or species habitat may occur within area
Cosmocampus darrosanus D'Arros Pipefish	Listed	Species or species habitat may occur within area
Doryrhamphus excisus Indian Blue-stripe Pipefish, Blue-stripe Pipefish	Listed	Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish	Listed	Species or species habitat may occur within area
Halicampus dunckeri Red-hair Pipefish, Duncker's Pipefish	Listed	Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish	Listed	Species or species habitat may occur within area

Halicampus nitidus Glittering Pipefish	Listed	Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish	Listed	Species or species habitat may occur within area
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish	Listed	Species or species habitat may occur within area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish	Listed	Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish	Listed	Species or species habitat may occur within area
Hippocampus bargibanti Pygmy Seahorse	Listed	Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse	Listed	Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse	Listed	Species or species habitat may occur within area
Hippocampus zebra Zebra Seahorse	Listed	Species or species habitat may occur within area
Micrognathus andersonii Anderson's Pipefish, Shortnose Pipefish	Listed	Species or species habitat may occur within area
Micrognathus brevirostris Thorn-tailed Pipefish	Listed	Species or species habitat may occur within area
Nannocampus pictus Painted Pipefish, Reef Pipefish	Listed	Species or species habitat may occur within area
Solegnathus hardwickii Pipehorse	Listed	Species or species habitat may occur within area
Solenostomus cyanopterus Blue-finned Ghost Pipefish, Robust Ghost Pipefish	Listed	Species or species habitat may occur within area
Solenostomus paradoxus Harlequin Ghost Pipefish, Ornate Ghost Pipefish	Listed	Species or species habitat may occur within area
Syngnathoides biaculeatus Double-ended Pipehorse, Alligator Pipefish	Listed	Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bend Stick Pipefish, Short-tailed Pipefish	Listed	Species or species habitat may occur within area
Trachyrhamphus longirostris Long-nosed Pipefish, Straight Stick Pipefish	Listed	Species or species habitat may occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake	Listed	Species or species habitat may occur within area
Aipysurus duboisii Dubois' Seasnake	Listed	Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake	Listed	Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake	Listed	Species or species habitat may occur within area

Astrotia stokesii Stokes' Seasnake	Listed	Species or species habitat may occur within area
Caretta caretta * Loggerhead Turtle	Listed	Species or species habitat may occur within area
Chelonia mydas * Green Turtle	Listed	Species or species habitat may occur within area
Crocodylus porosus Estuarine Crocodile, Salt-water Crocodile	Listed	Species or species habitat likely to occur within area
Dermochelys coriacea * Leathery Turtle, Leatherback Turtle, Luth	Listed	Species or species habitat may occur within area
Disteira kingii Spectacled Seasnake	Listed	Species or species habitat may occur within area
Disteira major Olive-headed Seasnake	Listed	Species or species habitat may occur within area
Enhydrina schistosa Beaked Seasnake	Listed	Species or species habitat may occur within area
Eretmochelys imbricata * Hawksbill Turtle	Listed	Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake	Listed	Species or species habitat may occur within area
Hydrophis mcdowelli	Listed	Species or species habitat may occur within area
Hydrophis ornatus a seasnake	Listed	Species or species habitat may occur within area
Lapemis hardwickii Spine-bellied Seasnake	Listed	Species or species habitat may occur within area
Laticauda colubrina a sea krait	Listed	Species or species habitat may occur within area
Laticauda laticaudata a sea krait	Listed	Species or species habitat may occur within area
Lepidochelys olivacea * Pacific Ridley, Olive Ridley	Listed	Species or species habitat may occur within area
Natator depressus * Flatback Turtle	Listed	Breeding likely to occur within area
Pelamis platurus Yellow-bellied Seasnake	Listed	Species or species habitat may occur within area
Whales and Other Cetaceans [Dataset Information]	Status	Type of Presence
Balaenoptera acutorostrata Minke Whale	Cetacean	Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale	Cetacean	Species or species habitat may occur within area
Balaenoptera musculus * Blue Whale	Cetacean	Species or species habitat may occur within area
Delphinus delphis Common Dolphin	Cetacean	Species or species habitat may occur within area
Grampus griseus	Cetacean	Species or species habitat may occur

Risso's Dolphin, Grampus		within area
Megaptera novaeangliae * Humpback Whale	Cetacean	Congregation or aggregation known to occur within area
Orcaella brevirostris Irrawaddy Dolphin	Cetacean	Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca	Cetacean	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin	Cetacean	Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin	Cetacean	Species or species habitat may occur within area
Tursiops aduncus Spotted Bottlenose Dolphin	Cetacean	Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin	Cetacean	Species or species habitat may occur within area

Places on the RNE [Dataset Information]
Note that not all Indigenous sites may be listed.

Natural

Conway Range - Mount Dryander Area QLD

Great Barrier Reef Region QLD

Extra Information

State and Territory Reserves [Dataset Information]

Conway National Park, QLD

Molle Islands National Park, QLD

Townsville/Whitsunday Marine Park, QLD

Other Commonwealth Reserves [Dataset Information]

Great Barrier Reef Marine Park, COM

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 Heritage and Register of National Estate properties, Wetlands of International 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 migratory and marine provisions of the Act have been mapped.

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.

Acknowledgments

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

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- 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
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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APPENDIX C

Vegetation Assessment Methodology

APPENDIX C: Vegetation Survey Methodology

C.1 Field Survey

Vegetation survey methods were based on Walter and Hopkins (1983) and Neldner (2004). A 1:5000 colour aerial photograph (overlain with topographical contours) of the site was used to assess the extent of broad vegetation types and to plan meander traverses and stratification of sampling points. Meander traverses were directed at parts of the site with tree cover while also examining intervening easements and road corridors.

For the major vegetation types, attributes were recorded at 1 secondary and up to 3 quaternary sites. Quaternary sites were stratified to cover the range of vegetation communities observed and recorded dominant overstorey and understorey species, height and canopy cover, site co-ordinates and terrain attributes. Quaternary data provided data for classifying and describing vegetation communities while also acting as ground validation points for the vegetation mapping. Quaternary sites are 'plotless', attributes being recorded within a 360 degree arc out to approximately 20 metres.

Where possible, one secondary site consisting of a 20 x 20 metre quadrat was recorded to validate a representative site within the major vegetation communities. Data recorded in the quadrat included a list of all plant species, their abundance, the basal area of woody species, vegetation structure, site location details and physical environment. Species abundance was measured as percent crown cover in Braun-Blanquet cover-abundance classes (Mueller-Dombois and Ellenberg 1974), as follows:

1. sparse, <5% crown-cover
2. any number, <5%
3. 5 – 25%
4. 25 – 50%
5. 50 – 75%
6. 75 – 100%

The abundance of tree species was also measured as basal area. Tree basal area (the cross-sectional area of tree stems) was measured using the Bitterlich stick method and a basal area factor of one (Neldner et al. 2004). Crown cover is the percentage of an area covered by the horizontal projection of the spread of a species' foliage (Walker and Hopkins 1990).

A complete inventory of all flora identified, and approximate distribution within the investigation area (**Appendix D**) was also recorded. Vegetation associations (including areas of marine vegetation) were mapped using differential GPS technology and plotted to the site plan (**Figure 5**). All woody vegetation possessing a diameter at breast height (DBH) of 50 millimetres or greater within the secondary site plot quadrats were mapped using differential GPS technology and are structurally described in **Appendix D**.

C.2 Data Analysis

Threatened Plant Species

Threatened plant species were determined according to the schedules of Queensland and Commonwealth threatened species legislation. The relevant Queensland legislation is the *Nature Conservation Act 1992*. Schedules 1, 2 3 and 4 of the *Nature Conservation Act 1992* and *Nature (Wildlife) Conservation Regulation 1994* gives the State listing of Presumed Extinct, Endangered, Vulnerable and Rare plants respectively. Species may also be protected under the Commonwealth *Environmental Protection and Biodiversity Act 1999*, which has Extinct, Endangered and Vulnerable categories.

Endangered Ecological Communities

The conservation status of vegetation communities was assessed according to the Schedule of Endangered Ecological Communities listed in the Commonwealth *EPBC Act 1999*.

Regional Ecosystems

Regional Ecosystems were assessed according to the *Vegetation Management Act 1999,* and the Regional Ecosystem Description Database (REDD) of the Environmental Protection Agency.

APPENDIX D

Site Plant Species List

APPENDIX D: Site Species List

Table D.1: Native and Exotic Flora Recorded from the Site

Family	Botanical Name	Common Name	Community	Occurrence	Form	Ende-micity	Pest Status	Conservation Status	
								NC Act	EPBC Act
Acanthaceae	*Harnieria hygrophiloides*	Hairy karambal	2	R	sH				
	Psuederanthemum variabile	Love flower	1,2	R	H				
Aizoaceae	*Sesuvium portulacastrum*	Sea purslane	4	vR	H				
Amyrallidaceae	*Crinum pedunculatum*	River lily	4,5	UC	H				
Anacardiaceae	*Euroschinus falcata*	Ribbonwood	1,2,5	UC	sT				
Apiaceae	*Apium prostratum*	Sea celery	4	vR	H				
	Hydrocoytle verticillata	Shield pennywort	4	vR	H				
Apocynaceae	*Alstonia scholaris (pl?)*	Milky pine	5	vR	T				
	Alyxia spicata	Chain Fruit	2	R	sH				
	Cynanchum carnosum	Mangrove milk vine	2,4,5	C	C/V				
	Heterostemma acuminatum	-	1,2,3	UC	V				
	Melodinus autralis	Southern melodinus	2	UC	V				
	Parsonsia longipetala	-	1,2,3,5	UC	V				
	Plumeria rubra cv. `Alba'	Franjipani	5	vR	sH	*			
	Tabernaemontana pandacqui	Banana bush	2	R	sH				
	Theveta peruviana	Captain cook tree	5	vR	sT	*	Class 3		
Arailiaceae	*Polyscias elegans*	Celerywood	2	R	sT				
	Mackinlaya macrosciadia	-	2,5	UC to C	sH/sT				
Araliaceae	*Polyscias australiana*	Ivory basswood	1,2,5	UC	sT				
	Schefflera actinophylla (NL,pl)	Umbrella tree	5	vR	sT				
Araucariaceae	*Araucaria cunninghamii (pl?)*	Hoop pine	5	vR	T				
	Araucaria heterophylla (pl)	Norfolk island pine	5	vR	T				

Aspleniaceae	*Asplenium paleaceum*	Scaly asplenium	2	R	F				
Asteraceae	*Bidens pilosa*	Cobbler's pegs	5	UC	H	*			
	Centipedea minima	-	2,4	C	H				
	Emilia sonchifolia	Emilia	1,2,3,5	UC	H				
	Peripleura hispidula	-	1,2,3,5	UC	H				
	Pterocaulon spachelatum	-	5	vR	H				
	Tridax procumbens	Tridax daisy	5	UC	H	*			
Avicenniaceae	*Avicennia marina ssp. australasica*	Grey mangrove	4	C	sT				
Bignoniaceae	*Pandorea pandorana*	Wonga vine	2,5	R	V				
Caesalpiniaceae	*Caesalpinea bonduc*	-	4,5	UC to C	sH				
	Chaemacrista maritima	-	5	vR	H				
	Cynometra iripa	Wrinkle pod mangrove	4	UC	sH/sT				
	Delonix regia (pl?)	Poinciana	5	vR	sT	*			
Capparaceae	*Capparis sp. (Bulburin P.I.Forster + PIF14542)*	-	2	vR	sT				
Caryophyllaceae	*Drymaria cordata ssp. diandra*	Tropical chickweed	2	R	H	*			
Casuarinaceae	*Allocasuarina torulosa*	Forest she-oak	3	R	sT				
	Casuarina cunninghamiana var. cunninghamiana (pl)	River Oak	5	vR	T				
Clusiaceae	*Calophyllum inophyllum*	Beauty leaf	5	vR	sT				
Combretaceae	*Lumnitzera racemosa*	Black mangrove	4	UC to C	sH/sT				
Cyperaceae	*Carex horsfieldii*	-	2	R	Se				
	Cyperus attenuata	-	2/4	vR	Se				
	Cyperus gracilis	Whisker grass	2	R	Se				
	Cyperus polystachyos	Bunchy sedge	2,5	UC	Se				
	Fimbristylis ferruginea	Fringerush	2,4	UC	Se				
	Fimbristylis pauciflorus	-	4	UC	Se				
	Fimbristylis polyanthemos	-	2,4	R	Se				
	Gahnia aspera	Saw sedge	1,2,3	C	Se				
	Scleria mackavensis	-	2	UC	Se				

Dryopteridaceae	*Coveniella poecilophlebia*	-	2	vR	F				
Ebenaceae	*Diospyros fasciculosa*	Grey ebony	2	R	sT				
	Diospyros geminata	Native ebony	1,2,3,5	C	sT				
	Diospyros hebecarpa	(an) Ebony	1,2	C	sT				
Epacridaceae	*Acrostichum aggregata*	Red ground berry	1,3	C	sH				
	Monotocca scoparia	Prickly broom heath	3	R	sH				
Euphorbiaceae	*Acalypha sp.*	-	2	vR	sH				
	Actephila petiolaris	-	2	R	sT				
	Drypetes deplanchei	White tulip	2	UC to C	sT				
	Excoecaria agallocha	Milky mangrove	4,5	C	sT				
	Glochidion lobocarpum	-	5	R	sH				
	Mallotus philippensis	Red kamala	2	R	sT				
	Mallotus polyadenos	-	2	vR	sT				
	Phyllanthus virgatus	-	1,2,3,5	UC	H				
Fabaceae	*Albizia lebbeck (NL,pl)*	Siris tree	5	vR	T	*			
	Crotalaria goreensis	Gambia pea	5	UC	H	*			
	Crotalaria pallida	Streaked rattlepod	5	C	H	*			
	Glycine microphylla	-	3	R	C				
	Leucaena leucocephala	White popinac	5	UC to C	sH	*			
	Macroptilium atropurpureum	Siratro	5	UC to C	H	*			
	Pongamia pinnata	-	5	R	sT				
	Sophora tomentosa	Silver bush	5	UC	sH				
Flacourtiaceae	*Scolopia brauni*	Flintwood	2	UC	sT				
	Streptothamnus moorei	Coast redberry vine	2,5	vR	V				
Goodeniaceae	*Scaevola sericea*	-	4,5	R	sH/sT				
Hemerocallidaceae	*Dianella caerulea var. vannata*	Blueberry flax lily	1,2,3	UC to C	H				
Juncaceae	*Juncus krausii*	Sea rush	4	R	Se				
Lauraceae	*Beilschmeidia obtusifolia*	Blush walnut	2	vR	T				
	Cassytha glabella	Dodder laurel	3,5	R	E				
	Cryptocarya bidwillii	Yellow laurel	2	R	sT				
	Cryptocarya murrayi	Murray's laurel	2	vR	sT				

	Endiandra muelleri	-	2	vR	sT				
	Litsea glutinosa	Scrub laurel	1,2	UC	sT				
Laxmanniaceae	*Cordyline murchisoniae*	-	2	R	sH				
	Lomandra confertifolia ssp. pallida	-	1	R	H				
Laxmanniaceae	*Lomandra filiformis*	-	1	R	H				
Lecythidaceae	*Planchonia decarya*	Cockatoo apple	1,2,3	C	E				
Loranthaceae	*Amyema mackayense*	Mangrove mistletoe	4	vR	E				
	Lysiana maritima		4	R	E				
Malvaceae	*Hibiscus heterophyllus*	Native Hibiscus	2	R	sH				
	Hibiscus tiliaceus	Cottonwood	4,5	C	sT				
	Thespesia populneoides	-	4,5	C	sT				
Meliaceae	*Melia azedarach var. azedarach*	White cedar	2,5	R	sT				
	Xylocarpus granatum	Cannonball mangrove	4	vR	sH/sT				
Menispermaceae	*Hypserpa decumbens*	-	2	R	V				
	Stephania japonica var. discolor	Tape vine	2	R	V				
	Tinospora smilacina	Tinospora vine	5	R to UC	V				
Mimosaceae	*Acacia alaucocarpa*	Brown salwood	1,2,5	R	sT				
	Acacia decora	Showy wattle	1,2,3,5	C	sH				
	Acacia leptostachya	-	1	R	sH				
	Acacia multisiliqua	-	1,2,3,5	C	sH				
	Acacia spirorbis ssp. solandri	-	1,2,3,5	C	sH/sT				
	Mimosa pudica	Sensitive Plant	5	R	sH	*			
Moraceae	*Ficus virens var. sublanceolata*	White Fig	2	vR	T				
Myoporaceae	*Myoporum attenuatum*	Coastal boobiala	4,5	R to UC	sH				
Myrtaceae	*Aegiceras corniculatum*	River mangrove	4,5	C	sT				
	Austromyrtus bidwillii	Python tree	2	UC	sT				
	Corymbia clarksoniana	Long-fruited Bloodwood	2,3,5	UC	T				
	Corymbia torreliana (pl)	Cadaghi	5	vR	T				
	Corymbia trachyphloia ssp. trachyphloia	Brown bloodwood	1,2,3	UC	T				

	Eucalyptus drepanophylla	Grey ironbark	1,2,3,5	vC	T				
	Eucalyptus exserta	Queensland peppermint	1,2,3,5	C	T				
	Eucalyptus portuensis	White mahogany	1,2,3	vC	T				
	Eucalyptus tereticornis	Queensland blue gum	2,5	UC to C	T				
	Eugenia reinwardtiana	Beach Cherry	2,5	UC	sH				
	Lophostemon confertus	Brush box	1,2,3,5	C	sT/T				
	Osbornia octodonta	Myrtle mangrove	4	UC to C	sH				
Mysinaceae	*Embelia australiana*	Embelia	2	vR	C				
Nyctaginaceae	*Bougainvillea sp. (NL,pl)*	-	5	vR	V	*			
Oleaceae	*Jasminum didymium ssp. lineare*	-	1,2,3	UC	V				
	Jasminum simplicifolium ssp. australiense	-	1,2,3	UC	V				
Pandanaceae	*Freycinetia scandens*	-	2	R	V				
	Pandanus spiralis	(a) Screw pine	2,5	UC ot C	sT				
Passifloraceae	*Passiflora foetida*	Stinking passionfruit	5	R	V	*			
	Passiflora suberosa	Corky passionfruit	1,2,5	UC to vC	V	*			
	Passiflora aurantia	Blunt-leaved passionfruit	2	R	C				
Pittosporaceae	*Bursaria tenuifolia*	-	1,2,3,5	C	sT				
	Pittosporum ferrugneum	Rusty pittosporum	2	R	sH				
Poaceae	*Aristida holanthera var. holathera*	-	1,2,3,5	UC to C	G				
	Aristida queenslandica	-	1,2,3,5	C	G				
	Chloris inflata	Purple-top chloris	5	UC	G	*			
	Chrysopogon fallax	Golden beard grass	1,2,3,5	UC	G				
	Cynodon dactylon	Couch	2,5	R	G				
	Dactyloctenium aegyptium	Coast button grass	5	UC	G				
	Digitaria didactyla	Queensland blue couch	5	R	G	*			
	Eragrostis spartinoides	-	1,2,3,5	UC	G				
	Eriachne pallescens var. pallescens	-	1,2,3,5	UC to C	G				
	Heteropogon contortus	Black speargrass	5	UC to C	G				
	Melinis minutifolia	Molasses grass	5	R	G	*			
	Oplismenus aemulus	Basket grass	2	UC	G				
	Ottochloa gracillima	Graceful grass	2	R	G				
	Panicum decompositum	-	1,2,3,5	C	G				

	Panicum effusum var. simile	Two-coloured Panic	1,2,3,5	UC to C	G				
	Panicum maximum var. maximum	Guinea grass	2,5	C	G	*			
	Paspalidium distans	Shotgrass	2,3	R	G				
	Rhychlytrum repens	Red natal grass	5	R	G	*			
	Sporobolus virginicus ssp. marina	Marine couch	4	C	G				
	Themeda quadrilateralis	Grader grass	5	R to UC	G	*			
	Themeda triandra	Kangaroo grass	1,2,3,5	UC	G				
Polypodiaceae	*Drynaria rigidula*	Basket fern	2,5	R	F				
	Platycerium bifurcatum	Elkhorn	2,4	R	E				
Proteaceae	*Banksia integrifolia var. compar*	Coastal banksia	3	R	sT				
Rhamnaceae	*Alphitonia excelsa*	Red ash	1,2,3,5	UC to C	sT				
Rhizophoraceae	*Bruguiera gymnorrhiza*	Large-leaved orange mangrove	4	C	sT				
	Ceriops tagal	Yellow mangrove	4	R	sH				
	Rhizophora apiculata	Tall-stilted mangrove	4	C	sH/sT				
	Rhizophora stylosa	Red mangrove	4	vC	sH/sT				
Rosaceae	*Cotoneaster glaucophyllus (pl?)*	Cotoneaster	5	vR	sH	*			
Rubiaceae	*Aida racemosa*	-	2	R	sT				
	Cyclophyllum coprosmoides	Coastal canthium	2	UC	sT				
	Ixora klanderiana	-	2	vR	sH				
	Kailarsenia ochreata	Native gardenia	1,2,3	C	sH/sT				
	Nauclea orientalis	Liechhardt tree	5	vR	sT				
	Pavetta australiensis var. australiensis	Butterfly bush	2	vR	sT				
	Pogonolobus reticulatus	-	1,2,3	UC	sH/sT				
	Psychotria sp. `Shute Harbour'	-	1,2	UC	sH				
	Pysdrax odorata ssp. australiana	Stiff canthium	2	UC	sT				
	Richardia stellaris	-	5	R	H	*			
	Timonius timon var. timon	-	2,5	R to UC	sH/sT				
Rutaceae	*Acronychia laevis*	Glossy acronychia	2	R	sH				
	Flindersia schottiana	Cudgeree	2	vR	T				
Santalaceae	*Exocarpos latifolius*	Broad-leaved native cherry	1,2,5	UC	sT				

Sapindaceae	*Alectryon tomentosum*	Hairy alectryon	2	R	sT				
	Arytera divaricata	Coogera	2	UC	sT				
	Cupaniopsis anacardioides	Tuckeroo	2,5	vR	sT				
	Harpullia pendula	Tulipwood	2	vR	sT				
	Jagera psuedorhus	Foambark	2	R	sT				
	Mischocarpus anodontus	Veiny pearfruit	2	UC	sT				
Sapotaceae	*Pouteria sericea*	Scrub plum	2	UC to C	sT				
Solanceae	*Solanum nigrum*	Blackberry Nightshade	5	R	H	*			
Sonneratiaceae	*Sonneratia alba*	Mangrove apple	4	R	sH/sT				
Sterculiaceae	*Heritiera littoralis*	Looking-glass mangrove	5	R	sT				
Tiliaceae	*Grewia retusifolia*	Dogs balls	5	R	sH				
Ulmaceae	*Celtis paniculata*	-	2	R	sT				
	Trema orientalis	Tree peach	2,5	UC	sH				
	Trema tomentosa var. viridis	Poison peach	2	R	sH				
Verbenaceae	*Clerodendrum floribundum*	Lolly bush	2,5	R	sH				
	Clerodendrum inerme	Mangrove lollybush	5	R to UC	C/sH				
	Gmelina fasciculifera	Northern white beech	2	vR	sT				
	Stachytarpheta jamaicensis	Blue snakeweed	5	R	sH	*			
	Vitex trifolia var. trifolia	-	5	UC	sH				
Vitaceae	*Cissus oblonga*	Shining grape	2	R	V				
Zamiaceae	*Cycas media*	Tree zamia	3	vR	sH				

Legend:

Key for "Community" Column of all Tables (within Appendices)

Code	Description
1	Grey ironbark *Eucalyptus drepanophylla* low woodland to open forest
2	Queensland Blue Gum *Eucalyptus tereticornis* Open Forest
3	Shute Harbour white mahogany *Eucalyptus portuensis* low woodland to open forest
4	Mangrove shrubland to low closed forest
5	Degraded disturbance areas

Key for "Occurrence" Column of all Tables (within Appendices)

Code	Description	
vC	Very Common	Dominant species within any particular stratum of the vegetation community
C	Common	Occurs frequently throughout the vegetation community
UC	Uncommon	Occurs at low frequency
R	Rare	Occurs individually or as only a few specimens

Key for "Form" Column of all Tables (within Text and Appendices)

Code	Description	
	Denotes	Comments
C	Creeper	Sprawling habit, prostrate, possibly climbing within the understorey
E	Epiphtye	Includes ferns and mistletoes
F	Fern	Extends to include treeferns
G	Grass	Poaceae family
H	Herb	Generally, plants lacking a woody stem
O	Orchid	Terrestrial or epiphytic plant of the Orchidaceae family
P	Palm	Arecaceae family (includes cycads)
Se	Sedge/Rushes	Includes members of Restionaceae, Cyperaceae and Juncaceae families
sH	Shrub	50cm to 4m in height
sT	Small Tree	4m to 12m in height
T	Tree	Greater than 12m in height
V	Vine	Climber with a vigorous habit that would pursue reaching canopy height, generally producing a thick woody stem

Key for "Endemicity" Column

Code	Description	
*	Exotic Species	The species may be naturalised, invasive and/or exotic in nature

Key for "Pest Status" Column

Code	Description
Class 3	Queensland's environmentally significant pests (in addition to Class 1 and 2 pests) - Class 3 pests are established in Queensland and have, or could have, an adverse economic, environmental or social impact. A pest control notice can only be issued for land that is, or is adjacent to, an environmentally significant area as per the Land Protection (Pest and Stock Route Management) Act 2002 and Regulation 2003

Key for "Conservation Status" Column

Code	Description
V	Status of taxon under Nature Conservation Act 1992 and Regulation 1994 Qld, Endangered (E), Vulnerable (V), Rare (R); Status of taxon under Environment Protection and Biodiversity Conservation Act, Critically Endangered (CE), Endangered (E), Vulnerable (V).

Table D.2: Declared Weeds Recorded from the Site

Botanical Name	Common Name	Status	Form
**Thevetia peruviana*	Captain Cook Tree	**Class 3**	sH

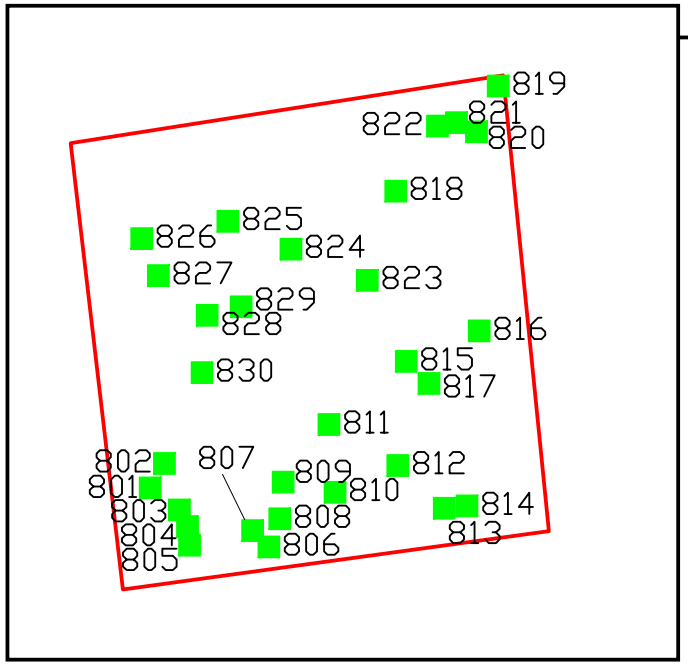
Class 3: Queensland's environmentally significant pests (in addition to Class 1 and 2 pests) **-** Class 3 pests are established in Queensland and have, or could have, an adverse economic, environmental or social impact. A pest control notice can only be issued for land that is, or is adjacent to, an environmentally significant area.
[as per the: "Land Protection (Pest and Stock Route Management) Act 2002 and Regulation 2003"]

APPENDIX E

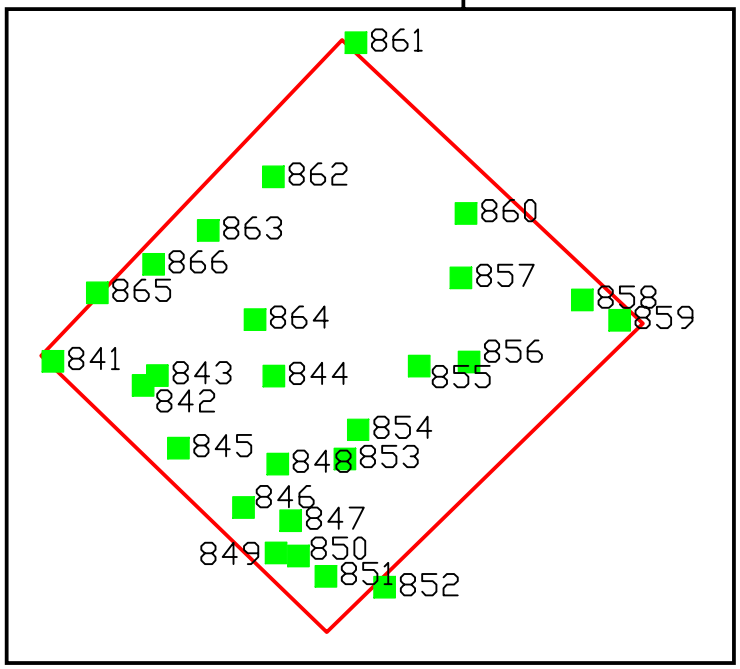
Survey Plot Descriptions

APPENDIX E: Vegetation Survey Plot Descriptions

Trees were surveyed at two survey plots for a variety of attributes including species, diameter at breast height (measure 1.5 metres above ground surface), height, spread, habitat value with respect to presence of hollows and health (estimated subjectively as good, fair and poor). Trees were accurately located in the field using differential GPS. The location of the two plots in relation to the site and location of trees is outlined in **Figure E.1** and tree details are presented as **Table E.1**.



SURVEY PLOT 1



SURVEY PLOT 1

5 0 5 10m approx.

PLACE Environmental
139 Gotha Street
Fortitude Valley, Qld 4006 AUSTRALIA
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SHUTE HARBOUR

VEGETATION SURVEY PLOTS

FIGURE E1
DATE: 10/05/2006
DWG NO./ISSUE: SHU01_ECO_E-1/A
SCALE: AS INDICATED

Table E.1: Tree Survey Data

Point No	*Species*	DBH (m)	Height (m)	Spread (m)	Habitat Hollows	Additional Comments	Health
Plot Quadrat #1 (Community 3)							
801	*Lophostemon confertus*	1.5	5	5	basal		Good
802	*Lophostemon confertus*	1	4	2	basal		Good
803	*Lophostemon confertus*	1	5	2	none		Good
804	*Lophostemon confertus*	1.5	5	2	none		Poor
805	*Lophostemon confertus*	1.5	5	2	none		Good
806	*Lophostemon confertus*	1	5	2	none		Good
807	*Corymbia trachyphloia ssp. trachyphloia*	1	5	3	none		Good
808	*Lophostemon confertus*	0.5	4	2	none		Poor
809	*Lophostemon confertus*	1.5	5	3	none		Good
810	*Eucalyptus portuensis*	1.5	4	2	none		Poor
811	*Eucalyptus portuensis*	2	5	4	none		Good
812	*Eucalyptus portuensis*	1	5	2	none		Good
813	*Lophostemon confertus*	1	5	4	none		Good
814	*Corymbia trachyphloia ssp. trachyphloia*	0.5	6	3	none		Good
815	*Eucalyptus exserta*	2	6	6	none		Good
816	*Eucalyptus portuensis*	3	8	6	none		Good
817	*Eucalyptus portuensis*	1	5	2	none		Good
818	*Corymbia trachyphloia ssp. trachyphloia*	2	7	4	none		Good
819	*Corymbia trachyphloia ssp. trachyphloia*	2	5	3	none		Good
820	*Lophostemon confertus*	0.5	5	2	none		Good
821	*Lophostemon confertus*	0.5	5	4	none		Good
822	*Lophostemon confertus*	0.5	5	3	none		Good
823	*Lophostemon confertus*	0.5	5	3	none		Senescing
824	*Corymbia trachyphloia ssp. trachyphloia*	2.5	7	6	small	numerous	Good
825	*Lophostemon confertus*	1.5	5	2	none		Good
826	*Lophostemon confertus*	1	5	3	none		Poor
827	*Lophostemon confertus*	1	5	4	none		Good
828	*Lophostemon confertus*	0.5	5	2	none		Good
829	*Lophostemon confertus*	1	5	4	none		Good
830	*Eucalyptus portuensis*	3	6	5	small		Good
Plot Quadrat #2 (Community 1)							
841	*Lophostemon confertus*	1	6	5	none		Good
842	*Acacia spirorbis ssp. solandri*	0.5	4	2	none		Good
843	*Eucalyptus portuensis*	2	4	4	pipes	small pipe fr s/o	Good
844	*Eucalyptus portuensis*	4	7	5	pipes	main leader s/o, termites occup	Good
845	*Corymbia trachyphloia ssp. trachyphloia*	0.5	4	3	none		Good
846	*Eucalyptus drepanophylla*	2.5	7	4	none		Good
847	*Eucalyptus portuensis*	2	6	5	none		Good
848	*Eucalyptus portuensis*	0.5	3	3	none		Senescing
849	*Eucalyptus portuensis*	2	7	3	none		Poor
850	*Lophostemon confertus*	1.5	5	2	none		Good
851	*Acacia spirorbis ssp. solandri*	0.5	5	2	none		Good
852	*Eucalyptus drepanophylla*	0.5	5	3	none		Good
853	*Corymbia trachyphloia ssp. trachyphloia*	0.5	5	2	none		Good
854	*"Stag" (dead tree)*	1.5	4	2	pipes	two long small pipes & basal hollow	Dead
855	*Eucalyptus portuensis*	2	7	4	pipes	one long 100mm trunk pipe @ 2m	Good
856	*Eucalyptus portuensis*	2	7	3	none		Good
857	*Eucalyptus portuensis*	1	6	4	none		Good
858	*Eucalyptus drepanophylla*	3	8	8	none		Good
859	*Lophostemon confertus*	1	6	3	none		Good
860	*Acacia spirorbis ssp. solandri*	1	6	3	none		Good
861	*Eucalyptus portuensis*	4	8	6	none		Good
862	*Lophostemon confertus*	2	6	8	none		Good
863	*Lophostemon confertus*	2	6	8	none		Good
864	*Eucalyptus drepanophylla*	2	7	4	none		Good
865	*Corymbia trachyphloia ssp. trachyphloia*	0.5	5	3	none		Good
866	*Eucalyptus drepanophylla*	2	9	6	none		Good

APPENDIX F

Comprehensive Vegetation
Community Descriptions

APPENDIX F: Comprehensive Vegetation Community Descriptions

Approximately sixty per cent (60%) of the site is vegetated with remnant or near remnant low eucalypt woodland, and thirty per cent (30%) with remnant mangrove shrubland to low closed forest, with the balance of the site supporting regrowth eucalypt woodland, degraded wasteland (quarry), degraded roadside batters and power-line and road easements. The following floral assemblages were identified on site (**Figure F.1**).

Community 1: Queensland grey ironbark low woodland to open forest

This community is represented on site by mapped units VC_6a, VC_6b, VC_7a and VC_7b. These associations are generally comprised of and dominated by mature (or remnant) *Eucalyptus drepanophylla* (Queensland grey ironbark and *Lophostemon confertus* (Brush box) on Mesozoic to Proterozoic igneous rocks, or Queensland grey ironbark with Eucalyptus tereticornis (Queensland Blue Gum) and Brush box within protected, unexposed slopes and drainage lines on Mesozoic to Proterozoic igneous rocks. VC_6a, VC_6b and VC_7 possessed a canopy cover of between 40 and 70%.

1a: Queensland grey ironbark/Shute Harbour White Mahogany open forest

The association is represented by VC_6a and VC_6b, and is situated upon a skeletal gravelly soils on a south-west facing slope with a grade of 15°. A power-line easement running west to east transects the southern extent of the association, while the western extent (in the vicinity of the disused quarry), is heavily degraded with **Passiflora suberosa* (Corky passionvine).

The canopy layer possesses an average median height of 12m, reaching a maximum height of 14m and a canopy cover of between 50 and 70%. The association is dominated by mature, wind-sheared Queensland grey ironbark, *Eucalyptus portuensis* (Shute Harbour white mahogany) and Brush Box with sporadic canopy *Acacia spirorbis ssp. solanderi*. The basal area of the community is 18m^3/ha.

The mid-stratum is comprised of *Alphitonia excelsa* (Red ash), *Acacia spirorbis ssp. solanderi* and juvenile canopy species. The shrub layer is generally dominated by X*anthorrhoea johnsonii* (Grass tree), *Planchonia decarya* (Cockatoo apple), *Pogonolobus reticulatus* and *Kailarsenia ochreata* (Native gardenia). Within VC_6b, the shrub layer is dominated by species characteristically associated with semi-evergreen vine thicket, including *Diospyros geminate, Diospyros hebecarpa, Psydrax odorata var. australiana* and *Bursaria tenuifolia*. This sub-association is associated with two steeply graded, ephemeral drainage lines.

The groundcover layer is dominated by *Gahnia aspera* (Saw Sedge), *Lomandra filliformis* (Mat-rushes), *Dianella caerulea* (Blueberry flax lily), *Panicum decompositum,* Corky passionvine and *Jasminum didymium ssp. lineare*.

Condition

Aside from the dominance of Corky passionvine within the groundcover layer, the association presents in good health with an intact canopy and no signs of active timber-getting, chemical application or gross clearing. A vast majority of the Shute Harbour white mahogany were found to possess small to mid-sized hollows (to 80mm) generally at the bend points in the main upper branches.

1b: Shute Harbour White Mahogany/Brush Box woodland to open forest

The association is represented by VC_7a and VC_7b, and both are situated upon a skeletal gravelly soils on a south-west facing slope with a grade of 8-10° in the eastern extent and 3-5° in the western extent. A power-line easement running west to east transects the southern extent of the association.

The canopy layer possesses a median height of 10m, reaching a maximum height of 16m and a canopy cover of between 40 and 50%. The association is dominated by Shute Harbour white mahogany and Brush box with

Corymbia intermedia (Pink bloodwood), *Corymbia clarksoniana* (Long-fruited Bloodwood) and Queensland grey ironbark occurring at lower densities within the canopy layer. The basal area of the community is 15m^3/ha.

The sub-canopy is dominated by juvenile canopy species and Cockatoo apple, while the mid-stratum is comprised predominantly of Grass tree, with sporadic *Indigophora pratensis*, Native gardenia, *Diospyros geminata, Acrotriche aggregata* (Red ground berry), *Acacia multisiliqua* and *Acacia decora (*Showy Wattle).

The groundcover layer is dominated by *Panicum effusum var. simile* (Two-coloured Panic), *Aristida queenslandica, Jasminum spp.* and *Lomandra multiflorum* (Many-flowered mat-rush).

Condition

The community presents in good health with an intact canopy and no signs of active timber-getting, chemical application or gross clearing. A vast majority of the Shute Harbour white mahogany were found to possess small to mid-sized hollows (to 80mm) generally at the bend points in the main upper branches. The groundcover log distribution was approximately 15% of the total cover.

Significant Species

With reference to the *Nature Conservation (Wildlife) Regulation 2006* and the *Environment Protection and Biodiversity Conservation Act 1999,* no endemic threatened species of conservation significance were recorded from this vegetation type.

Conservation Status

These community are analogous with remnant Regional Ecosystem (RE) 8.12.14, which is described as, "Variable eucalypt dominated associations, often with *Eucalyptus drepanophylla, E. crebra, Acacia spirorbis subsp. solandri, Lophostemon confertus and E. exserta*, on islands and rocky headlands, on Mesozoic to Proterozoic igneous rocks, and Tertiary acid." As of December 2005 this RE has a conservation status of "Not of Concern". This community possesses a high ecological value and landscape amenity and would greatly benefit from assisted rehabilitation.

Community 2: Queendsland Blue Gum Open Forest

This community is represented on site by mapped unit VC_2a, VC_2b and VC_3. These associations tend to represent a wetter association of the typical community description for RE 12.8.14 (Community 1) and occur on the lower slopes and/or alluvial flats of coastal granite hills. The canopy layer is generally comprised of and dominated by mature Eucalyptus tereticornis (Queensland blue gum) and/or Queensland grey ironbark or Queensland peppermint.

2a: Queensland blue gum/Queensland peppermint woodland to open forest

The association is represented by VC_2a and VC_2b, and both are situated upon a coarse grain to gravel colluvium and alluvial wash of the upslope granite with a high component of silt and organic matter. The associations have a southerly aspect and relatively flat grade of less than 3°. The batters of the associated toe of slope flowing into this association are similarly vegetated, if not reflective of an ecotonal merge with Community 1 and 3.

The canopy layer possesses a median height of 14m and a canopy cover of between 40% and 70%. The association is dominated by mature Queensland blue gum and Queenland peppermint with sporadic Queensland grey ironbark. The average basal area of the community was 19m^3/ha.

The sub-canopy is generally comprised of juvenile canopy species, Brush box and *Bursaria tenuifolia*. In places, the latter species forms a dominant layer with the sporadic occurrence of vine thicket species such as

Mackinlaya macrosciadia, Euroschinus falcata (Ribbonwood), *Austromyrtus bidwillii* (Pyton Tree), *Diospyros spp., Eugenia reinweinwardtiana* (Beach Cherry) and *Alectryon tomentosa* (Hairy Alectryon), particularly upstream. The mid-stratum is dominated by *Pandanus spiralis* (Screw Pine) with sporadic occurrence of *Acacia multisiliqua*, Red ash, Native gardenia, *Tabernaemontana orientalis, Endiandra meulleri, Polycias australiana* (Ivory basswood) and *Cynanchum carnosum* (Mangrove wax-flower vine).

The groundcover is dominated by *Panicum decompositum* (Native Millet), *Jasminum didymum* and Corky passionvine

Condition

Aside from the dominance of Corky passionvine within the groundcover layer, the association presents in good health with an intact canopy and no signs of active timber-getting, chemical application or gross clearing. A number of mature Queensland blue gum (greater than 300m dbh) within VC_2a were found to possess small to mid-sized hollows (to 150mm).

2b: Queensland blue gum/Queensland grey ironbark woodland to open forest

The association is represented by VC_4a and VC_4b, and both are situated upon a coarse grain to gravel colluvium and alluvial wash of the upslope granite with a high component of silt and organic matter. The associations have a southerly aspect and relatively flat grade of less than 1°. The association has been markedly thinned and is reflective of an ecotonal merge with Community 4.

The canopy layer possesses a median height of 12m and a canopy cover of between 30 and 40%. Queensland blue gum and Queensland grey ironbak dominate the canopy layer. Pink bloodwood and Long-fruited bloodwood occur sporadically, particularly within VC_4b.

The mid-stratum is relatively sparse and limited to a sporadic distribution of *Acacia spirorbis ssp. solandri,* Screw Pine, *Excoecaria agallocha* (Milky mangrove), *Myoporum acuminatum* and **Leucanea leucocephala* (White Popinac).

The groundcover layer is dominated by *Fimbristylis* spp., Mangrove wax-flower vine, *Centipeda minima,* **Panicum maximum var. maximum* (Guinea grass), *Cyperus* spp., *Sporobolus virginicus var. marina* (Marine Couch) and a variety of herbaceous roadside/wasteland weeds.

Condition

The community represents disturbed regrowth lower slope variant of Community 2a and was found be moderately to heavily degraded with grasses and herbaceous weeds associated with the nearby roadside batters. Due to the construction of Shute Harbour Road the association has lost its natural ecotone and hydrological regimes asssociated with the mangrove community the immediate south.

Significant Species

With reference to the *Nature Conservation (Wildlife) Regulation 2006* and the *Environment Protection and Biodiversity Conservation Act 1999*, no endemic threatened species of conservation significance were recorded from this vegetation type.

Conservation Status

These associations are analogous with the lower slope variant of remnant Regional Ecosystem (RE) 8.12.14, (described above). This community possesses a moderate ecological value and landscape amenity and would greatly benefit from assisted rehabilitation.

Community 3: Shute Harbour white mahogany low woodland to open forest

This community is represented on site by mapped unit VC_1 and VC_3. This association tends to represent Shute Harbour white mahogany wind-sheared low woodland to open forest on granite coastal hills. The association occurs on south and east facing slopes.

Shute Harbour white mahogany low woodland to open forest

The association is represented by VC_1 and VC_3, and both are situated upon skeletal gravelly soils on south to east facing slopes with a grade of between 10 - 20°. A disused access track running west to east transects the southern extent of the VC_1. The track has naturally regenerated.

The canopy layer possesses a median height of 6 to 8m and a canopy cover of between 40 and 60%. Shute Harbour white mahogany dominates the canopy layer, while Pink bloodwood, *Corymbia trachyphloia ssp. trachyphloia* (Brown bloodwood), Brush box, Queensland peppermint and, to a lesser degree, Long-fruited bloodwood dominate the sub-canopy layer. The average basal area of the community was 22m^3/ha.

The mid-stratum is densely vegetated and comprised of prdominantly Forest grass tree. Cockatoo apple, Red ground berry, *Acacia multisiliqua, Pogonolobus reticulatus* and Showy Wattle occur commonly.

The groundcover layer is dominated by juvenile Grass tree, Two-colured panic, *Aristida queenslandicum, Panicum decompositum* and *Lomandra spp.*

Condition

The community presents in good health with an intact canopy and no signs of active timber-getting, chemical application or gross clearing. A vast majority of the Shute Harbour white mahogany were found to possess small to mid-sized hollows (to 100mm) generally at the bend points in the main upper branches. The groundcover log distribution was approximately 10% of the total cover.

Significant Species

With reference to the *Nature Conservation (Wildlife) Regulation 2006* and the E*nvironment Protection and Biodiversity Conservation Act 1999*, no endemic threatened species of conservation significance were recorded from this vegetation type.

Conservation Status

This community is analogous with remnant Regional Ecosystem (RE) 8.12.5c, which is described as "*Eucalyptus portuensis* and *Lophostemon confertus* +/- Corymbia intermedia open forest occurring at low to moderate altitudes on near coastal hills on Mesozoic to Proterozoic igneous rocks". As of December 2005, this RE had a Vegetation Management Act 1999 conservation status of "Not of Concern". This community possesses a high ecological value and landscape amenity.

Community 4: Mangrove shrubland to low closed forest

This community is represented on site by mapped units VC_5a-f. These associations tend to represent dense mangrove low closed forest to shrubland within the western extent of the distribution. The associations dominate the entire seaward edge of the site located on the southern side of Shute Harbour Road. A small grove of this vegetation type was identified centrally within the site on the northern side of the road in association with a culvert necessary to collect and disperse flows from ephemeral drainage lines Eph#3, 4a, 4b, 5a and 5b.

Mangrove shrubland to low closed forest

The association is represented by VC_5a, VC_5a1 VC_5b, VC_5c, VC_5d, VC_5e and VC_5f and all are situated upon estuarine clays and colluvial gravel. Rock pavement occurs commonly in the western and absolute eastern extent. In general, the association has a southerly aspect with a grade of less than 4°. At the time of survey the moon was at the top of its cycle and greater than 80% of the community was tidally inundated.

The canopy layer possessed a variable median height, ranging from 1.5m to of 4.5m and a variable canopy cover of between 40 and 90%.

VC_5a and VC_5a1 are dominated by *Rhizophora stylosa* (Red mangrove), *Rhizophora apiculata* (Tall-stilted mangrove) and *Bruguiera gymnorhiza* (Large-leaved orange mangrove) to 5m in height, predominantly on the seaward extent *Avicennia marina ssp. australasica* (Grey Mangrove) and *Osbornia octodonta* (Myrtle mangrove) dominate the landward extent. Ceriops tagal (Yellow Mangrove), *Lumnitzera racemosa* (Black mangrove) and *Excoecaria agallocha* (Milky mangrove) occur sporadically within the landward and central extent. The midstratum is dominated by juvenile canopy species while the groundcover layer is virtually absent. Sporadic small patches of either Marine couch and/or *Suadea australis* (Sea blite) were recorded at the absolute northern (landward) extent.

VC_5a2 represents a small grove dominated by juvenile Red and Tall-stilted mangrove and pneumatophores of VC_5a.

VC_5b is dominated by *Aegiceras corniculatum* (River mangrove) and Grey mangrove to 2m in height, with sporadic occurrences of Red and Tall-stilted mangrove. Myrtle mangrove occurs sporadically.

VC_5c is dominated by River and Grey mangrove to 3m in height.

VC_5d and VC_5e are dominated by River mangrove and Grey mangrove to 2m in height, with sporadic occurrences of Red and Tall-stilted mangrove to 6m in height. Myrtle mangrove occurs sporadically.

VC_5f represents a small grove of marine vegetation on the landward (northern) side of Shute Harbour Road which is associated with a drainage culvert that routinely allows saltwater inundation. The community is situated within a low depression. Black and Milky mangrove, *Hibiscus tiliaceus* (Cottonwood) and, to a lesser extent, *Thespesia populnioides* dominate the canopy layer. The median height of the association is 3.5m. The groundcover is dominated by Mangrove wax-flower vine and Marine couch with sporadic occurrences of

Crinum pedunculatum (River Lily) and *Juncus krausii* (Sea rush). Two large patches of Marine couch with Mangrove wax-flower vine were recorded immediately adjacent to this community.

Condition

The community presents in good health with limited to no weed incursion. VC_5f possesses the greatest of weed incursion.

Significant Species

With reference to the *Nature Conservation (Wildlife) Regulation 2006* and the *Environment Protection and Biodiversity Conservation Act 1999*, no endemic threatened species of conservation significance were recorded from this vegetation type.

Conservation Status

This community is analogous with remnant Regional Ecosystem (RE) 8.1.1, which is described as "Open shrubland to closed forest of mangrove species forming a variety of associations, depending on their position in relation to tidal channels an the amount of freshwater input they receive….". As of December 2005, this RE had a Vegetation Management Act 1999 conservation status of "Not of Concern". This community possesses a high ecological value and landscape amenity.

Community 5: Degraded disturbance areas

This community is represented on site by mapped units VC_8 and VC_9. These associations tend to represent disturbance areas associated with a disused quarry and associated abandoned infrastructure, roadside batters and power-line easements.

5a: Roadside batters

This association is represented by fragmented groves of mid-mature regrowth (VC_8a to VC_8g) along the seaward side of Shute Harbour Road. The composition of these associations is variable and in places appears to have been planted.

VC_8a represents a degraded, fragmented grove dominated by regrowth Queensland peppermint, *Acacia multisiliqua*, Cottonwood, *Vitex tifolia var. trifolia* and *Thespesia polpulnioides*.

VC_8b represents a grove of Queensland grey ironbark to 12m with a mixed shrubby understorey which includes S*ophora tomentosa* (Silver bush), *Trema orientalis* (Tree peach), *Caesalpinia bonduc* and *Thespesisa polpulnioides.*

VC_8c represents amid-dense grove of *Vitex trifolia var. trifolia,* Cottonwood, and **Leucanea leucocephala* (White popinac), with sporadic Screw pine, Grey mangrove, Milky mangrove, River lily, *Caesalpinia bonduc* and *Thespesisa polpulnioides.*

VC_8d represents a dense knoll of vegetation immediately associated with the southern outlet of the drainage culvert. The association is dominated by mature Queensland grey ironbark and a lone *Araucaria cunnighamii* (Hoop pine) to 16m. The dense mid-stratum is dominated by Cottonwood and *Thespesisa polpulnioides* to 9m in height. *Pongamia pinnata, Clerodendrum inerme*, Tree peach and River lily dominate the shrub layer.

VC_8e represents a sporadic, fragmented distribution of Queensland peppermint, *Acacia spirorbis ssp. solandri* and occasional Queensland grey ironbark to 10m in height. The mid-stratum and groundcover layer is dominated by White popinac and Guinea grass respectively.

VC_8f represents a dense grove of Cottonwood to 8m in height. The mid-stratum and groundcover layer is dominated by White popinac and Guinea grass respectively. Heriteria littoralis (Looking Glass Mangrove) occurs sporadically on the toe of the batter on the seaward side of the grove.

VC_8g represents a fragmented distribution of *Acacia spirorbis ssp. solandri* and White popinac to 9m in height. Sporadic Ribbonwood, Milky mangrove and *Thespesisa polpulnioides* occur throughout. A large amount of organic garden refuse was recorded at the eastern extent of the association. The groundcover layer is dominated by Guinea grass and **Chloris inflata* (Purple-top chloris).

5b: Disused quarry

This association is represented by VC_9a. The natural landform and hydrological regimes have been markedly and indefinitely altered through the construction of a quarry. The fringing edges of the quarry walls, quarry floor and areas immediately associated with an abandoned residence/office are dominated by Guinea grass, Corky passionvine and **Macroptilium atropurpureum* (Siratro). Queensland grey ironbark, Shute Harbour white mahogany and Large-fruited bloodwood occur sporadically to the north-west of the residence. Isolated planted trees such as *Casuarina cunninghamiana* (River oak), **Plumeria rubra cv* "Alba" (Franjipani), *Albizia lebbeck* (Siris tree) and *Corymbia torreliana* (Cadaghi) occur to the south of the residence.

5c: Power-line easement

A power-line easement transects the landward vegetation on the northern side of Shute Harbour Road, primarily within the eastern extent of the site. The easement runs from west to east and is approximately 8m wide and accessible to four-wheel vehicles. The community is restricted to a groundcover layer dominated by *Heteropgon contortus* (Black speargrass), Two-coloured panic, *Eriachne pallescens var. pallescens* and A*ristida queenslandica*. Regrowth *Acacia multisiliqua*, Showy wattle and Brush box to 1m in height occur sporadically. The easement appears to be slasher maintained.

Condition

The community, as a whole, presents in poor health with marked weed incursion and dominance particularly within the lower strata. Aside from preventing soil erosion and buffering the mangrove community (VC_8a-g) the community provides limited ecological significance.

Significant Species

With reference to the *Nature Conservation (Wildlife) Regulation 2006* and the *Environment Protection and Biodiversity Conservation Act 1999*, no endemic threatened species of conservation significance were recorded from this vegetation type.

Conservation Status

This association is not analogous with any described regional ecosystem.

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PLACE ENVIRONMENTAL

SHUTE HARBOUR

VEGETATION COMMUNITIES

FIGURE F1
DATE: 17/09/2007
DWG NO./ISSUE: SHU01_ECO_F1_B
SCALE: 1:2500 @ A3

APPENDIX G

Fauna Survey Methodology

APPENDIX G: Fauna Survey Methodology

G.1 Historical Data Sources

In order to assist in the identification of the range of species which given suitable habitat and seasonal conditions, could utilise habitat types on the site, and to identify the suite of state and nationally threatened species which might be present on the site if suitable habitat was present, reviews of existing reports (Connell Wagner 2005) and data from the WildNet (Data Search Area: 5 kilometre buffer around a point located in the centre of the study site (coordinates: Latitude: - 20.2886, Longitude 148.7786) and the Commonwealth Department of Environment and Heritage Matters of National Environmental Significance databases were collected. Records were obtained from a). Results of the Wildlife On-line[1] (Qld) search are provided in **Appendix B.1** and results of the Protected Matters Database Search[2] (C'wlth) are outlines in **Appendix B.2**.

The search area covers an area much larger than the study site to maximise identification of regional flora species with the potential to occur on site. The presence of particular species in the results however does not imply that those species will definitely be found on the study site.

Threatened and significant[3] fauna identified by these data sources were identified and their habit, habitat preferences, microhabitat requirements and an assessment of potential presence based on potential habitat was made. Prior to field sampling, threatened species assessed as being potentially present on the site were identified for the purposes of developing targeted species survey methodologies. Targeted surveys were conducted either during or in conjunction with systematic sampling of the study area.

Post survey these species were again sorted based on confirmed potential habitat and/or presence and/or regional records, into the final categories:

1. *Confirmed* – species recorded on the site.

2. *Possible* – species not confirmed on site, but confirmed presence in the DSA (WildNet) and therefore considered to probably occur based on the availability of specific habitat.

3. *Unlikely* – no habitat suitable and/or no local database records.

Fauna habitats represented on the site and their consequent potential importance to species particularly threatened species, were initially identified from aerial photograph interpretation and vegetation mapping.

[1] http://www.epa.qld.gov.au/nature_conservation/wildlife/wildlife_online (accessed 15/02/2007)

[2] http://www.deh.gov.au/erin/ert/epbc/index.html (accessed 15/02/2007)

[3] For the purpose of the assessment threatened and rare species are defined as endangered and vulnerable species under the *Nature Conservation Act 1992 (Qld)* and *Nature Conservation (Wildlife) Regulation 1994 (Qld)* and the *Environment Protection and Biodiversity Conservation Act 1999 (C'wlth)* (EPBC Act). Threatened communities are those ecological communities identified by the EPBC Act and *endangered* and *of concern* Regional Ecosystems identified by the *Vegetation Management Act 1999 (Qld)* (VM Act) and Environmental Protection Agency biodiversity status. Significant species and communities are species of special interest being not well understood, at the extent of their natural range or extension of a previously known range, are significant at the Central Queensland Coast Bioregional level, are migratory species subject to the EPBC Act or the schedules of the Japan-Australia Migratory Bird Agreement, the China-Australia Migratory Bird Agreement.

G.2 Sampling Methodolgy

G.2.1 Sampling Conditions

The field assessment was undertaken over the period 22-26 August 2006. Weather data for the period was characterised by fine clear mild diurnal conditions and cool overnight temperatures.

G.2.2 Sampling Locations

Areas for the placement of sample sites were selected based on aerial photo interpretation. Site selection was based on the range of habitats likely to be present. Alternative sites were identified in each of the habitats outlined with the intention that final sites would be selected in the field by taking into account such factors as level of disturbance, road access and the impact of prevailing weather conditions, all of which could not be determined by interpretation. Sites selected for field sampling were done so on the basis that they optimised sampling effort and so represented the major habitat units present, were least disturbed and which were accessible during all weather conditions.

G.2.3 Field Methods

Overview

The survey was conducted under Animal Ethics Committee Certification (Registration Certificate 40, Bribie 27/11/04) issued by the Department of Primary Industries Bribie Island Animal Ethics Committee (Animal Welfare Unit) to PLACE Environmental.

Fauna were surveyed PLACE Environmental by utilising a number of standard live trapping, active search, direct and indirect observation methods used to determine the diversity, abundance and habitats of fauna occurring in the area. While all fauna groups were assessed, particular effort was placed on identifying in the field and searching habitats that could contain threatened, rare and significant species. Sample sites consisted of both fixed and supplementary sites.

Fixed (Trapline) Sites

Fixed or trapline site locations ('TL' sites) are shown as **Figure 6**. Techniques employed in part or in full as part of systematic sampling at each of the fixed sites included:

- Terrestrial box trapping (Elliot A)
- Pit trapping comprising 4 x 20 litre buckets with a 0.4 metre high drift buried to a depth of 0.05 – 0.1 metre
- Terrestrial hair tubing
- Diurnal and nocturnal herpetile searches
- Diurnal area bird searches
- Ultrasonic microchiropteran bat (AnaBat) call detection
- Walked spotlight transects
- Searches for tracks, scats and other traces
- call playback of nocturnal birds.

Additional (Supplemental) Sites

Fixed sites were complemented by a number of supplemental sites. With the exception of trapping, many of the aforementioned sampling techniques were also utilised throughout the study area supplement data collected at the fixed (trapline) sites. Techniques employed as part of systematic sampling at each of the fixed sites included:

- diurnal and nocturnal reptile searches;
- nocturnal amphibian searches;
- diurnal area bird searches;
- ultrasonic microchiropteran bat (AnaBat) call detection;
- walked spotlighting transects;
- searches for tracks, scats and other traces; and
- call playback of nocturnal birds.

Description of Survey Techniques

Microchiropteran Bats

Echolocation calls of microchiropteran bats were sampled using an AnaBat II ultrasonic echolocation detector (Titley Electronics, Ballina NSW) with calls recorded onto microcassette using a Vox CTR-107 voice activated cassette recorder.

Thirty minute walked transects within a 1.5 ha area were conducted at each of the three fixed sample sites and at selected supplemental sampling sites. A 50 watt spotlight was used during the transects to locate flying bats and scan vegetation for megachiropteran species.

Potential roost sites were searched for during the survey in an opportunistic manner. Searches were conducted in a number of hollow trees located throughout remnant bushland. Spotlighting was undertaken in the vicinity of walking AnaBat echolocation call detection transects. A limited number of hollow bearing trees were observed at dusk to record emerging bats and other species

Terrestrial Mammals

Up to 23 type A Elliott box traps were deployed for a minimum of four nights at each fixed site. The traps were baited with a mixture of peanut butter, rolled oats, linseed oil, honey and bacon. A small quantity of almond essence (3 drops) was added to each bait mix. This was well mixed and the bait allowed to stand overnight. Type A traps were set at 10-12 metre intervals or where suitable groundcover existed.

One 'peddle triggered' cage trap measuring 300 x 300 x 720 mm was set at each of the traplines. Whereas traps set in terrestrial locations were baited with sweet potato, apple and Elliott trap baits.

Faunatech Hair funnels baited with rolled oats and honey were deployed on the ground at all fixed sites. Five arboreal and five ground hair funnels were located at all fixed sites for three nights duration. Traps were baited with type A Elliott box trap mix. Funnel wafers were forwarded to Barbara Triggs, Genowa, Victoria for hair identification.

Spotlighting was conducted on foot using 50-watt hand-held spotlights. Sampling effort comprised 0.5 person hours over a 1.5 ha area. Spotlighting was conducted between the hours of 1900 and 0100 hours. All main bushland remnant areas within the study area were surveyed. Spotlighting involved scanning trees, flowering plants and the ground for animal activity.

Large mammals were recorded when encountered during trapping, bird survey and spotlight survey, and along roads and tracks throughout the study area.

Birds

Specific bird surveys were conducted throughout representative habitats in an area measuring 300 x 50 m during the early and late morning and late afternoon. Surveys were conducted by random area searches within selected habitats. Species were identified by call or observation. Sampling comprises two consecutive 10 min counts conducted in the period 0500 - 1000 hours and 1500 - 1800 hours. Notes on number of species and activity of birds observed or heard in each of the 10 min counts were recorded. Additional bird species records were compiled incidentally, during spotlight survey and from vocalisations. Nocturnal species were recorded by observation during spotlight surveys or by characteristic calls.

Nocturnal birds were also detected utilising call playback. Playback was undertaken utilising a TOA 23 W hand held megaphone modified with an audio input, coupled to a Creative MuVo mp3 player. Recordings of nocturnal bird calls were prepared especially for the study area with calls from various CD's produced by David Stewart. The method utilised involved the establishment of fixed call playback sites where upon arrival at each site 15 minutes was spent quietly listening for nocturnal birds. When observed or heard, other animals were noted as incidental observations. Following the quiet listening period, calls were played utilising the following process. A particular species call was played for approximately 3 minutes. This was followed by 5 minutes quiet listening and then 5 minutes spotlighting of trees in the immediate vicinity of the call playback site. This process was then repeated for the remaining calls.

Calls recorded and played were, Rufous Owl (*Ninox rufa queenslandica*), Southern Boobook *N. novaeseelandiae*, Barking Owl *N. connivens*, Barn Owl *Tyto alba*, Masked Owl *T. novaehollandiae*, Australian Owlet-nightjar *Aegotheles cristatus,* Tawny Frogmouth *Podargus strigoides*, Papuan Frogmouth *P. papuensis*, Large-tailed Nightjar *Caprimulgus macrurus*, Spotted Nightjar *Eurostopodus argus* and White-throated Nightjar *E. mystacalis.*

Amphibians and Terrestrial Reptiles

Timed area searches (20 minute searches within an area measuring 300 x 50m) for herpetiles (reptiles and amphibians) were undertaken at each of the fixed locations and supplemental sites across the study area. Some sites were sampled more than once. Diurnal searches were conducted between 0500 and 1800 hours. Active searching for reptiles included scanning of trees and ground, removal of cover such as rocks and fallen logs, peeling the bark from trees and raking of leaf litter. Other observations and records were compiled at sampling sites and along tracks within and adjacent to the study area.

Timed nocturnal transect searches (20 minute searches) for herpetiles were undertaken at fixed sites 1 and 3 and at four additional sites across the study area. Searches were conducted between 1900 and 0100 hours. Active searches included searching with a spotlight or low watt torch along within terrestrial remnants and along the margins of waterbodies, searching amongst vegetation, turning deadwood, debris, rocks and raking forest litter.

Indirect Methods

Indirect fauna records were compiled from evidence of fauna presence, including tracks (footprints, burrow paths, runways), traces, scats, tree marks (scratches), nests, skeletal remains or other signs. Searches of predator scats suitable for analysis of hair and bone fragments were also undertaken. Predator scats and owl pellets were forwarded to Barbara Triggs, Genoa, Victoria for identification. Tracks, non-predator scats and other signs were identified with reference to Triggs (1996). Bones and skulls were forwarded to the Queensland Museum for analysis.

Opportunistic Sightings

Fauna sightings outside of systematic survey times (as outlined above) were recorded.

G.3 Taxonomy and Nomenclature

Nomenclature and common names used in this report follows that described in Christidis & Boles (1994) for birds, Cogger (2000) for reptiles and amphibians, and Strahan (1998) for mammals.

Additional texts utilised for species identification and general reference include Menkhorst & Knight (2001), Barker, Grigg & Tyler (1995) for amphibians, Blakers *et al.* (1984), Schodde & Tidemann (1990), Slater & Slater (1994) and Simpson & Day (1999), Flegg (2002), Beruldsen (1995), Debus (1998) for birds, and Parnaby (1992) and Churchill (1998) for bats.

APPENDIX H

Site Fauna List

Appendix H: Site Fauna Survey Results

Family	*Scientific Name*	Common Name	Status		Habitat	Method of Detection
			NC Act	EPBC Act		
Reptiles						
Agamidae	*Diporiphora australis*	Tommy Roundhead			f	hc
Gekkonidae	*Heteronotia binoei*	Bynoe's Gecko			f	t
Scincidae	*Carlia foliorum*				f	hc/t
	Cryptoblepharus virgatus	Wall Skink			f/c	o/hc/t
	Glaphyromorphus punctulatus				f	t
	Lampropholis delicata	Garden Sun-skink			f/c	hc/t
	Morethia taeniopleura	North-eastern Firetail Skink			m	o
Birds						
Accipitridae	*Haliastur indus*	Brahminy Kite			m/i	o
	Pandion haliaetus	Osprey			m/i	o
Artamidae	*Artamus leucorynchus*	White-breasted Woodswallow			f/c/m	o
	Cracticus quoyi	Black Butcherbird			f/m	o
	Strepera graculina	Pied Currawong			f/c	o
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo			f	o
Caprimulgidae	*Eurostopodus mystacalis*	White-throated Nightjar			f	o
Columbidae	*Geopelia humeralis*	Bar-shouldered Dove			f/c	o
Dicruridae	*Dicrurus bracteatus*	Spangled Drongo			f	o
	Monarcha leucotis	White-eared Monarch			f	o
	Monarcha trivirgatus	Spectacled Monarch			f	o
	Myiagra rubecula	Leaden Flycatcher			f/m	o
Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra			f/c	o
	Todiramphus sanctus	Sacred Kingfisher			f/m	o
Hirundinidae	*Hirundo neoxena*	Welcome Swallow			f/c	o
Meliphagidae	*Meliphaga lewinii*	Lewin's Honeyeater			f/m	o
	Melithreptus albogularis	White-throated Honeyeater			f	o
	Myzomela obscura	Dusky Honeyeater			f/m	o
	Philemon buceroides	Helmeted Friarbird			f/m	o
Meropidae	*Merops ornatus*	Rainbow Bee-eater			f/m/c	o
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella			f	o
Oriolidae	*Sphecotheres viridis*	Figbird			f/m	o
Pachycephalidae	*Colluricincla megarhyncha*	Little Shrike-thrush			f	o
Pardalotidae	*Gerygone magnirostris*	Large-billed Gerygone			m	o
	Gerygone palpebrosa	Fairy Gerygone			f	o
Mammals						
Dasyuridae	*Planigale maculata*	Common Planigale			f	t
Molossidae	*Nyctinomus australis*	White-striped Freetail Bat			f/c	s
Muridae	*Melomys cervinipes*	Fawn-footed Melomys			f/m	t
	Rattus fuscipes	Bush Rat			f/m	t
Peramelidae	*Isoodon macrourus*	Northern Brown Bandicoot			f	t
Pteropodidae	*Pteropus alecto*	Black Flying-fox			f/m	o
Suidae	*Sus scrofa*	Pig			f	s
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna			f	o
Vespertilionidae	*Miniopterus australis*	Little Bent-wing Bat			f	s

Notes:

NC Act Status: Indicates the conservation status of each taxon under the Queensland Nature Conservation Act 1992. The codes are; Presumed Extinct (PE), Endangered (E), Vulnerable (V) or Rare (R).

EPBC Act Status: Indicates the conservation status of each taxon under the Commonwealth Environment Protection and Biodiversity Conservatin Act 1999, Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW), Vulnerable (V) and Threatened (includes taxa listed as CD, CE, E, EX, V and XW)

Habitat: cleared areas (C); woodland/open forest (F); mangroves (M); intertidal (I)

Detection Method: trap (t); hand capture (hc); hair tube (ht); observation (o); track, scat or other trace (s)

APPENDIX I

Weather Condition

Proserpine, Queensland
August 2006 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Tu	15.4		0.4						20.0	71	1	S	11	1017.8	23.6	55	1	ESE	22	1014.2
2	We		24.3				ENE	30	12:17	18.6	74		SSE	6	1018.0	23.1	42		ESE	19	1013.6
3	Th	9.1	28.3	0			SSW	31	14:03	17.7	80	0		Calm	1018.0	27.6	25	1	SSW	19	1013.2
4	Fr	7.7	24.5	0			SE	46	10:49	18.7	45		SSE	9	1020.6	21.9	30		ESE	22	1017.1
5	Sa	4.3	22.9	0			E	31	12:09	16.9	54		ENE	7	1022.1	22.3	32		E	17	1017.6
6	Su	4.3	24.8	0			E	43	14:37	17.1	47		S	11	1021.5	22.7	39		E	28	1018.1
7	Mo	7.0	23.8	0			ESE	52	15:28	20.0	59		SSE	15	1022.8	22.1	34		ESE	35	1020.0
8	Tu	12.5	23.2	0.4			SE	54	10:01	19.3	61		SSE	26	1025.9	21.9	52		ESE	28	1023.8
9	We	8.0	24.4	0			SE	50	10:36	18.2	62		S	11	1025.3	23.4	30		ESE	22	1021.3
10	Th	5.7	25.3	0			ESE	35	15:36	18.1	64		SW	6	1022.4	23.5	26		E	22	1019.1
11	Fr	4.2	24.4	0			SSE	56	11:30	18.1	53		SE	9	1023.1	22.8	45		ESE	20	1021.5
12	Sa	14.0	24.2	0			SE	46	11:13	19.6	74		SSE	15	1023.4	22.5	56		SE	31	1020.8
13	Su	12.7	24.1	0			SE	44	11:52	21.1	66		SSE	17	1022.5	22.3	58		ESE	28	1019.7
14	Mo	9.2		0						19.9	68	1	SSE	13	1022.0	23.1	48	1	ESE	22	1018.3
15	Tu		25.8				SE	37	14:37	18.4	71			Calm	1021.5	25.0	27	0	E	20	1017.5
16	We	8.8	25.1	0			ESE	37	13:08	19.4	62	1	S	9	1021.9	23.7	51	1	ESE	22	1019.9
17	Th	13.1	23.8	0			ESE	39	13:17	21.1	61	5	SE	22	1022.7	22.9	42	7	ESE	22	1020.5
18	Fr	13.2	25.6	0			SE	39	11:27	22.1	64	3	SE	20	1022.8	22.2	52		ESE	22	1019.9
19	Sa	8.7	25.6	0.2			SE	41	10:59	20.4	63		SSE	15	1022.1	22.8	56		ESE	26	1019.4
20	Su	13.8		0						22.4	63		SE	24	1022.0						
21	Mo		26.5				E	31	11:40	20.7	72	1	S	7	1022.9	24.3	48	0	ESE	17	1019.3
22	Tu	8.9		0						19.8	71	0	NNW	2	1022.5	28.2	37		ESE	17	1017.6
23	We		30.6				NNE	31	15:59	20.7	77	0	N	9	1020.4	29.5	28		NE	11	1016.4
24	Th	9.0	29.6	0			N	30	15:11	19.8	78	0	N	9	1020.5	28.0	35	1	NNE	17	1016.2
25	Fr	10.7	28.7	0			NNW	31	11:51	21.9	72	1	NNW	7	1019.2	27.5	31		NNW	20	1014.6
26	Sa	11.2	30.5	0			NNE	33	13:38	23.0	69		WNW	9	1017.8	28.0	46		NNE	22	1013.2
27	Su	11.7	28.4	0			E	33	13:44	21.3	74		SW	6	1019.1	25.5	54		ESE	20	1016.3
28	Mo	13.9	27.5	0			ESE	33	13:25	22.7	66	2	SSW	9	1020.3	25.4	52	1	ESE	19	1016.0
29	Tu	11.6	26.6	0			ESE	37	13:26	21.0	67	1	SSE	11	1020.2	24.9	57		ESE	24	1017.2
30	We	14.3	26.4	0			ESE	46	14:48	23.4	61	5	SE	33	1020.2	24.8	58	2	ESE	30	1017.2
31	Th	17.1	23.0	0			SE	35	10:08	21.6	71	7	SSE	24	1018.2	20.2	90	8	SSE	13	1016.0
Statistics for August 2006																					
	Mean	10.4	25.8							20.1	65	1		12	1021.3	24.2	44	2		21	1017.9
	Lowest	4.2	22.9							16.9	45	0		Calm	1017.8	20.2	25	0	NE	11	1013.2
	Highest	17.1	30.6	0.4			SSE	56		23.4	80	7	SE	33	1025.9	29.5	90	8	ESE	35	1023.8
	Total			1.0																	

Observations were drawn from Proserpine Airport {station 033247}

IDCJDW4096.200608 Prepared at 13:26 GMT on 5 Jan 2007

Proserpine, Queensland
September 2006 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Fr	17.6	22.6	6.4			SE	43	03:30	20.9	75	8		Calm	1017.6	21.2	90	8	ESE	19	1015.2
2	Sa	19.1		5.0						22.1	78		SE	26	1019.4	23.1	78		SE	31	1017.2
3	Su		24.4				SE	39	12:54	21.8	87		SE	19	1020.2	23.2	76		ESE	22	1017.0
4	Mo	18.5	28.6	0.8			SSE	46	09:57	21.4	87	7	SE	11	1019.1	27.3	54	6	ESE	17	1014.9
5	Tu	17.1	29.0	0.2			SE	31	15:33	22.6	79	2	SSE	7	1019.0	27.8	52	1	ESE	17	1015.4
6	We	17.7	28.8	0			NE	28	16:06	22.2	79	7	SW	4	1019.7	28.2	57	2	E	13	1014.3
7	Th	16.7	31.0	0			NNW	41	15:20	25.1	69	2	WNW	20	1016.3	28.6	58	2	NNW	28	1010.6
8	Fr	10.8	25.8	0			SE	33	09:29	21.4	42	0	SE	9	1017.2	25.0	29	0	SE	19	1013.5
9	Sa	8.1	25.6	0			SE	37	10:11	20.2	53		SE	6	1018.9	24.7	28		E	17	1014.8
10	Su	8.0	28.1	0			SW	33	09:51	20.5	44		N	4	1018.6	27.2	15		W	11	1014.4
11	Mo	4.8	24.1	0			ESE	33	10:02	19.0	35	0	SE	17	1021.3	23.6	29	1	ESE	20	1018.3
12	Tu	9.4	25.2	0			ESE	56	14:56	21.5	41	1	SSE	26	1023.2	23.3	51	2	ESE	35	1020.1
13	We	16.1	24.5	2.0			SE	67	11:09	21.0	61	5	SE	28	1024.8	22.9	55	3	SE	43	1021.9
14	Th	16.5		0.2			SE	63	11:00	22.5	55	3	SE	35	1025.5	22.8	52	6	SE	41	1023.1
15	Fr									20.6	70				1026.1	23.1	52	7	ESE	31	1022.4
16	Sa		25.8				SE	41	09:02	22.6	58		SE	26	1024.2	23.8	49		E	26	1019.4
17	Su	12.4	25.7	0			ESE	46	14:15	22.8	60		SE	22	1022.8	22.9	56		ESE	31	1018.5
18	Mo	14.0	25.9	0			SE	52	10:52	22.7	57	2	SE	30	1023.8	24.0	44	2	ESE	33	1020.8
19	Tu	17.6	25.8	0.6			ESE	50	12:45	20.6	84		ESE	17	1024.6	24.0	48	2	ESE	24	1020.5
20	We	15.6	25.9	4.8			ESE	41	13:03	19.7	84	8	S	11	1022.0	23.1	57	6	SE	26	1016.6
21	Th	15.3	28.3	0			E	39	14:20	23.8	62	2	SE	13	1019.2	26.9	32	1	ESE	26	1014.8
22	Fr	12.7	27.3	0			ESE	35	12:07	23.6	64	3	SSE	19	1019.2	26.0	58	6	SE	28	1015.6
23	Sa	19.1	27.6	0			SE	43	08:32	24.4	66		SE	30	1018.5	26.1	53		SE	31	1015.3
24	Su	14.2	27.7	0			SE	35	11:23	23.6	64		SE	15	1018.3	27.1	37		ESE	20	1014.4
25	Mo	15.1	28.9	0			ESE	39	12:38	25.1	60		ESE	24	1017.2	26.9	48	1	ESE	28	1013.8
26	Tu	18.5	27.5	0			SE	48	10:03	25.6	64	4	SE	31	1017.6	25.8	63	3	SE	30	1015.8
27	We	18.5	27.3	0			SE	43	10:13	23.8	56	3	SE	30	1019.7	25.6	55	1	SE	30	1016.2
28	Th	16.5	28.2	0			SE	39	10:30	23.9	63		SE	22	1019.9	27.0	42		E	20	1015.7
29	Fr	15.5	28.0	0			SSE	48	11:00	23.9	58	3	ESE	22	1020.0	26.1	49	1	E	26	1016.0
30	Sa	15.0	29.3	0			E	37	14:34	24.7	56		SSE	17	1018.6	26.9	35		ESE	26	1015.0
Statistics for September 2006																					
Mean		14.8	26.9							22.5	63	3		18	1020.4	25.1	50	3		25	1016.7
Lowest		4.8	22.6							19.0	35	0		Calm	1016.3	21.2	15	0	W	11	1010.6
Highest		19.1	31.0	6.4			SE	67		25.6	87	8	SE	35	1026.1	28.6	90	8	SE	43	1023.1
Total				20.0																	

Observations were drawn from Proserpine Airport {station 033247}

IDCJDW4096.200609 Prepared at 13:23 GMT on 4 Jan 2007

APPENDIX J

Limitations of the Assessment

APPENDIX J: Study Limitations

J.1 General

Ecological surveys often fail to record all species of flora and fauna present on a site for a variety of reasons such as seasonal absence, temporal and spatial variability in response to resource availability or reduced activity during certain seasons. For example, many birds are nomadic moving throughout the landscape in response to availability of resources, and reptiles are less active during winter and can be difficult to detect during these months. In addition, the ecology and nature of rare and cryptic species means that such species are often not recorded during short surveys.

Collection and analysis of historic database records is used as a strategy to overcome short assessment guidelines; a habitat suitability analysis is performed to identify potential site utilisation by significant species known from the area based on suitable habitat presence and ecological connectivity. A precautionary approach is adopted.

The primary focus of the assessment was to identify significant flora and fauna issues in the context of the potential development of the site. For this purpose the review of existing information in combination with the habitat assessment is considered adequate.

The conclusions contained within this document are intended exclusively for the purposes outlined in Section 1.2 of this report. The scope of services performed in the execution of this investigation may not be appropriate to satisfy the needs of other users, and any use or reuse of this documents findings, conclusions and recommendations presented herein is at the sole risk of any other user.

Flora data collection was generally qualitative, with relative abundance of the canopy and shrub layer estimated in order to assist with identification of the vegetation association. The fauna assessment was undertaken over a period of one week using box traps, cage traps and hair tubes as well as noting all fauna as they were encountered (observed, heard, hand captured) and utilising timed fauna (bird, frog, reptile) surveys. Potential fauna presence was based on habitats recorded on the site and local area records sourced from the Environmental Protection Agency's (EPA) WildNet Database. Such a short sampling timeframe can only be considered a 'snapshot' assessment.

As such it is unlikely that all the methods employed have allowed the detection of species that may utilise the area either seasonally (e.g. migratory birds) or temporally (e.g. nomadic birds or species with extremely large home ranges). Nor may it account for species that may have been in low numbers in response to eco-climatic, and/or temporal, and/or seasonal factors and which may not have been detected. Such variations can only be accounted for by long-term, detailed assessments of several years duration (e.g. refer How 1998, Maron et al 2005). In order to overcome such limitations, databse searches (WildNet and Birds Australia) have been conducted widely generally for a 5 kilometre radius around the site. Such databases contain data that has typically been collected over a comparatively longer period of time, and includes sampling from different season. Furthermore this data has been vetted for reliability by recognised authorities.

The information and recommendations contained within are based solely on data generated by this assessment and no warranty can be expressed over results that may be generated by studies investigating diversity, abundance or habitat utilisation in the future. The report does not purport to provide statistical validity to the data obtained.

More specific climatic and other limitations for each fauna group are discussed below.

J.2 Limitations Affecting Specific Botanical Groups

A consequence of the survey being towards the end of the dry season, was the absence of flowering bodies on many of the plants present. Absence of these can make identification difficult. Similarly, some plants, for example several species of terrestrial orchid, are only prominent at certain times of the year, coinciding with summer.

J.3 Limitations affecting specific Faunal Groups

The survey consisted of a single dry (winter) seasonal assessment performed over a four five period in August 2006. While efforts to compensate this limitation were undertaken, these being the identification and compilation of species data collected by various authors and researchers, from various times of the year, such a short sampling timeframe can only be considered a 'snapshot' assessment. As such it is unlikely that all the methods employed have allowed the detection of species that may utilise the area either seasonally (*eg.* migratory birds) or temporally (*eg*. nomadic birds or species with extremely large home ranges). Nor may it account for species which may have been in low numbers in response to ecological factors and which may not have been detected. Such variations can only be accounted for by long term, detailed assessments of several years duration (*eg.* refer How 1998).

The study was undertaken in mild conditions there was a general absence of herpetile that would normally be expected at such sites.

Tidal influence was also a limiting factor for trapping mangrove communities to the south of the road. Traps were placed above the high tide line, however at least one of the targeted threatened mammals known from the locality, the Water Mouse *Xeromys myoides*, is known to forage primarily in areas that are only exposed at lower tides. For this reason, trapping locations at the site were not ideal for detecting the Water Mouse.

One significant limitation during the survey period was the abundance of Green Tree Ants at the site. These aggressive ants entered most of the traps and hair tubes deployed at the site, quickly clogging hair tube tape and preventing these from being effective. The ants were also responsible for the fatality of one Fawn-footed Melomys *Melomys cervinipes*, which was almost entirely consumed while trapped in a cage trap overnight. Following this example some traps were relocated in an attempt to minimize impacts by Green Tree Ants.

Methodologies used during the study are also believed to have at times caused limitations to the study. The use of ultrasonic echo-location (AnaBat) call recording allows for the identification of microchiropteran bats whose calls are sufficiently different from other species. Similarly bat species that fly high above the forest canopy typically are not well represented within ultrasonic censuses of microbat fauna. Additionally some calls are distorted by the equipment, some bats have short, soft or varying calls and calls may be distorted by mist or rain. Therefore this technique often does not provide a clear representation of diversity or abundance.

Identification of hair or bone fragments to species level is often difficult unless it is a monotypic species. Often identification can only be to genus level or to a group of species within the same genus typically being those with similar morphological characteristics.

A summary of the suitability of climatic conditions during the survey period for specific faunal groups is outlined.

Amphibians

- Climatic conditions during the survey period were not optimal for detecting amphibians. Surveys for this group should be conducted following extended rainfall periods.
- Timing of the survey was suitable, however most amphibians are more active during the warmer summer months.
- These limitations have been overcome through analysis of sub-regional database lists of amphibians found in the local area, with habitat requirement extrapolated and applied to the site as a basis for determining potential presence.

Reptiles

- Climatic conditions during the survey period were moderately suitable for detecting reptiles.

Birds

- Climatic conditions during the survey period were suitable for detecting most bird species.
- Timing of the survey was suitable for resident bird species, however many birds (particularly waders) are summer migrants and would not occur at the Site during the survey period.
- The absence of freshwater wetlands was a significant limitation to the detection of birds that are dependent on this habitat.

Mammals

- Climatic conditions during the survey period were suitable for detecting mammals.
- Timing of the survey was suitable for most mammal species.