# Appendix G

# Flora and Fauna

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# FLORA AND FAUNA SURVEY OF LOT 260 DP 1110719, SANDY BEACH MILL, WOOLGOOLGA

**Prepared for**

**Sandy Beach Mill Pty Ltd**

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# GLOSSARY

**Abundance:** means a quantification of the population of the species or community.

**Affected species:** means subject species likely to be affected by the proposal.

**Assessment guidelines** means assessment guidelines issued and in force under section 94A of the *Threatened Species Conservation Act 1995* or, subject to section 5C of the Fisheries Management *Act 1994.*

**CHUMA:** Coffs Harbour Urunga Management Area.

**Conservation status:** is regarded as the degree of representation of a species or community in formal conservation reserves.

**Critical habitat:** the area declared to be critical habitat under Part 3 of the *Threatened Species Conservation Act 1995*.

**DEC:** Department of Environment and Conservation.

**Development:** the erection of a building on that land, the carrying out of work in, on, over or under that land, the use of that land or of a building or work on that land, and the subdivision of that land.

**Endangered ecological community:** an ecological community specified in Part 1 of Schedule 1 of the *Threatened Species Conservation Act 1995.*

**Endangered population:** a population specified under Part 1 of Schedule 1 of the *Threatened Species Conservation Act 1995.*

**Endangered species:** a species listed under Schedule 1 of the *Threatened Species Conservation Act 1995.*

**EPA Act:** *Environmental Planning and Assessment Act, 1979*.

**Habitat:** an area or areas occupied, or periodically or occasionally occupied by a species, population or ecological community and includes any abiotic component.

**Locality:** the area within a 5 km radius of the study area**.**

**NPW Act:** *National Parks and Wildlife Act 1974.*

**Recovery and threat abatement plan:** a plan to promote the recovery of threatened species, population or an ecological community with the aim of returning the species, population, or ecological community to a position of viability in nature.

**ROTAP:** Rare or threatened Australian plant.

**SEPP:** State Environmental and Planning Policy.

**Site:** the area which is proposed for development or activity.

**Study area:** is the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly.

**Threatened species:** a species specified in Part 1 or 4 of Schedule 1 or in Schedule 2 of the *Threatened Species Conservation Act 1995.*

**Threatening process:** means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities. This definition is not limited to key threatening processes.

**TSC Act:** *Threatened Species Conservation Act 1995.*

**Vulnerable species:** a species listed under Schedule 2 of the *Threatened Species Conservation Act 1995* or when a fish, listed under the *Fisheries Management Act 1994*.

# SUMMARY


- This flora and fauna study was prepared on behalf of Sandy Beach Mill Pty Ltd to accompany an environmental assessment for Stage 2 of the subdivision of Sandy Beach Mill. The site is located approximately 20 km north of Coffs Harbour and 3 km south of Woolgoolga.
- The proposed development includes 42 residential allotments plus residue land to be dedicated to Council.
- Flora and fauna surveys were undertaken on 13 September 2005, 4 September 2006 and 26 April 2009.
  Each survey involved approximately five hours at the site and extended to land beyond the site, both to the north and south of Double Crossing Creek.
- The site was once a timber mill which has been decontaminated by the owners over the last four years. Accordingly, over half of the site comprises of cleared land and the residue is exotic grassland with woodland remnants fronting Double Crossing Creek.
- A discussion of the relevant threatened species known from the vicinity of the site is included in this report. This discussion addresses the likelihood of threatened species occurring at the site.
- The assessment of the potential impact of the proposal concluded there would be no significant effect on threatened species, populations, ecological communities or their habitats due to the disturbed nature of the site and the preservation of remnant vegetation and habitats of conservation significance, fronting Double Crossing Creek.
- Restoration works which commenced in 2005 are showing great promise in re-establishing wildlife connections to Hearns Lake and to the hinterland. This proposal will continue these conservation initiatives.


Stage 2 Sandy Beach Mill

Lot 260 DP 1110719

Internal road

Existing indigenous planting

Revegetation planting

Existing site trees

Avenue of street trees

Groups of trees

Feature tree

Shade tree

New Eucalyptus planting

New Casuarina planting

Shrub/groundcover

Turf

1.2 metre pathway

Pedestrian bridge

Boulders/planting to swale

Pavement

Pedstrian zone

Play equipment with softfall

Picnic shelter

Timber elements

Bikeway as per DCP

Peter Parker

# Fig. 1: Proposed Development


Peter Parker

**Fig. 2: Layout and Asset Protection Zones**

# 1.0 INTRODUCTION AND PROJECT DESCRIPTION

This flora and fauna survey has been prepared on behalf of Sandy Beach Mill Pty Ltd for the second stage of a subdivision of the Sandy Beach Mill site at Woolgoolga, northern NSW. The site is located approximately 20 km north of Coffs Harbour and 3 km south of Woolgoolga. The site has an area of 7.89 ha with a frontage of 284.5 m to Graham Drive and includes part of a small catchment to Double Crossing Creek (Figs. 1 and 2).

On the 19 February 2008, Coffs Harbour City Council issued Development Consent 508/07 for a staged development incorporating the site. Stage 1 of this development involved the creation of 24 Torrens title residential allotments and a residue allotment. Stage 2 is the subdivision of the remainder of Lot 260 DP 1110719 and the subject of this environmental assessment.

Stage 2 is the creation of 42 Torrens Title residential allotments and land to be dedicated to Council as a public reserve (park). The reserve will incorporate part of Double Crossing Creek (Fig. 1). The proposed development falls within the coastal areas part of Schedule 2 (section 1(j)(i)) of State Environmental Planning Policy (Major Projects) 2005 and was declared to be a Major Project by the Minister for

Planning on the 20 October 2008. The proposed development is therefore to be assessed as a Major Project pursuant to Part 3A of the *Environmental Planning and Assessment Act* (the EPA Act) and specification were issued with respect to this development by the Department of Planning on 23 January 2009 ("DGR's").

Stage 2 includes the extension of the three north-south roads approved in Stage 1, with the western and eastern roads forming a perimeter to the proposed public reserve (Fig. 1).

It provides for varied allotment sizes within the estate, with allotments ranging from 410 $m^2$ to 1,360 $m^2$.

Housing has been setback from Double Crossing Creek in order to maintain a riparian buffer, to avoid flood prone land and to provide an asset protection zone. The perimeter road separating housing and the public reserve will ensure that 'edge effects' to the public reserve (park) and Double Crossing Creek are mitigated.

There is a single access point to Graham Drive. Road 1 has a road reserve of 18 m and Road 2 has a width of 5.5 m. Road 3 has a reserve width of 24 m and sufficient area has been allowed for a bio-retention facility and a central boulevard to Double Crossing Creek.

The Project also includes the continuing rehabilitation of Double Crossing Creek which was commenced prior to the

Stage 1 consent. Rehabilitation includes weed control, revegetation and restoring existing native plant communities.

Creek rehabilitation will incorporate ongoing weed control to allow revegetation areas to become dominant over weedy areas. A geofabric will be utilised in steep locations to stabilise the friable embankment soils. This will be pinned to the bank and holes cut for tubestock plantings.

A cycleway is proposed across Double Crossing Creek This will be located on the property adjoining the site to the east.

## 1.1 Project brief (DGR's flora and fauna requirements)

The DGR's specifications with respect to flora and fauna issues (issues 9.1-9.3) and the Hearns Lake riparian corridor require (issue 11.2):

*9.1 the potential impact of the development of flora and fauna taking into consideration impacts on any threatened species, populations, endangered ecological communities and/or critical habitat and any relevant recovery plan in accordance with DECC's Guidelines for Threatened Species Assessment (2005), having particular consideration for impacts on the Osprey*;

*9.2 Outline measures for the conservation of existing wildlife corridor values and/or connective importance of any vegetation on the subject land*;

*9.3 Address measures to protect and manage adjacent aquatic habitats including Double Crossing Creek,*

*including impacts due to the increased recreational usage/visitation;*

*11.2 Address measures to protect and manage the Double Crossing Creek riparian corridor, including the provision of appropriate buffers, having consideration for the Hearns Lake Estuary Management Plan and the Hearns Lake Sandy Beach development control plan*

# 2.0 PREVIOUS STUDIES OR REPORTS

Previous studies which have relevance to the site or which relate to flora and fauna assemblages in the Coffs Harbour region include:

- BMT WBM June 2009 Hearnes Lake Estuary Management Study and Plan;
- Coffs Harbour City 1999 Koala plan of management, Part A;
- GHD Pty Ltd 2009 Sapphire Beach Properties Pty Ltd Report for Sandy Beach Mill Subdivision Water Quality Assessment;
- NPWS 1995 Vertebrates of upper north-east NSW. A report by the NSW National Parks and Wildlife Service to the Natural Resources Audit Council;
- Parker, P 2006 Flora and Fauna Survey of Lot 260 DP 752853, Sandy Beach Mill, Woolgoolga. A report to Sandy Beach Mill Pty Ltd;
- Sheringham P., and J. Westaway 1995 Significant vascular plants of upper north-east NSW. A report by the NSW National Parks and Wildlife Service for the Natural Resources Audit Council. This report identifies significant flora species and vegetation communities in the North Coast Region;

- Smith, A.P., S.P. Andrews, G. Gration, D. Quin and B. Sullivan 1995 Coffs Harbour/Urunga management area (CHUMA) EIS, supporting document No. 4, fauna. A report to State Forests of NSW;
- State Forests 1995 Environmental impact statement for the proposed forestry operations in the Coffs Harbour and Urunga management areas. A report prepared by State Forests, NSW; and
- WBM Oceanics 2005 Hearns Lake background data review (and references contained therein). A report to Coffs Harbour City Council.

# 3.0 FIELD SURVEYS

Flora and fauna surveys were undertaken on 13 September 2005 and 4 September 2006 for the Stage 1 subdivision and on 26 April 2009 for this proposal. Each site visit and survey included approximately five hours and extended beyond the site, both to the north and south of Double Crossing Creek. Fauna analysis included a Department of Environment and Climate Change ("DECC") database review[1], a habitat evaluation and observations of vertebrate species including conspicuous scratches or diggings.

The DGR's refers to *DECC's Guidelines for Threatened Species Assessment (2005)* with respect to assessment of

[1] DECC threatened species records supplied under licence to Peter Parker Environmental Consultants Pty Ltd on 26 June 2009

significance. While the *DECC's Guidelines for Threatened Species Assessment (2005)* are substantive and deal in some length with survey techniques and effort, they are not particularly relevant in the current circumstances where over half of the site proposed for development comprises of cleared land subject to remediation and the remainder is dominated by exotic grassland, much of which has been sown with grass seed following rehabilitation. In such circumstances, the DECC draft guidelines states: *"a statement must be made which addresses the factors of the Assessment of Significance for each of the threatened species, populations and ecological communities that occur or are likely to occur in the area to be affected by the proposed development, activity or action. This statement must clearly demonstrate and substantiate that the proposal is unlikely to have a significant effect on threatened biodiversity."*

The DECC draft guidelines, in "Step 5", establishes an assessment protocol. In accordance with the DGR's, the survey effort and methodology presented are considered sufficient to adequately address "Step 5".

## 3.1 Vegetation

### 3.1.1 Air photo interpretation

Vegetation was mapped over a coloured aerial photograph, supplied by Bill Mills, at a scale of approximately 1:2000 and

dated May 2009. Vegetation patterns were ground truthed for accuracy (refer to Fig. 3).

### 3.1.2 Vegetation classification, structure and floristics

The vegetation classification system adopted for this survey is based on Beadle and Costin (1953) and Walker and Hopkins (1990). This system describes the components of the association in the following order:

- the first species is usually the most abundant in the tallest stratum;
- a second species is chosen when it is always present in the tallest stratum. In the absence of a tallest stratum species, the most abundant species in the next most conspicuous stratum is chosen. For those associations where several species dominate, these are listed in order of abundance;
- a third species is chosen from any stratum, usually a ground cover or shrub layer. It is used as an indicator species;
- the forest type refers to the distances between the crowns of adjacent trees (Table 1); and
- the height of the tallest stratum is defined by the terms 'low', 'mid-high', or 'tall' (Table 2).

### 3.1.3 Vegetation transects

Vegetation associations were surveyed and mapped on 26 April 2009 by walking in meandering transects spaced at approximately 10 m intervals throughout the site. This survey

included transects along the southern bank of Double Crossing Creek and targeted searches for threatened plant species which could potentially occur along Double Crossing Creek (see Table 3 at page 6).

The following features of the vegetation were noted:

*10* dominant trees, shrubs and ground covers in each strata (Table 1);

*11* major plant species in the association;

*12* tree heights and foliage cover; and

*13* any threatened species.

**Table 1: Structural formation classes defined by growth form and crown separation (after Walker and Hopkins 1990)**

| Crown Separation | Closed or dense | Mid-dense | Sparse | Very sparse | Isolated plants | Isolated clumps |
|---|---|---|---|---|---|---|
| Field criteria | Touching-overlapping | Touching slight separation | Clearly separated | Well separated | Isolated | Isolated |
| Growth form | | | | | | |
| Tree | Closed forest | Open forest | Woodland | Open woodland | Isolated trees | Isolated clumps of heath shrubs |
| Heath shrub | Closed heathland | Heathland | Open heath | Sparse heath | Isolated heath shrubs | Isolated clump of heath shrubs |
| Sedge | Closed sedgeland | Sedgeland | Open sedgeland | Sparse sedgeland | Isolated sedges | Isolated clump of sedges |
| Sod grass | Closed sod grassland | Sod grassland | Open sod grassland | Sparse sod grassland | Isolated sod Grasses | Isolated clumps of sod grasses |

**Table 2: Height classes and names of various growth forms for non-rainforest associations (after Walker and Hopkins 1990)**

| Height metres | Trees, vines | Shrubs, heath shrubs, chenopod shrubs, mallee (tree or shrub form) | Tussock and hummock grasses, forbs, rushes, sedges, ferns | Sod grasses, mosses, lichens, liverworts |
|---|---|---|---|---|
| 20.01-35.01 | Extremely tall | NA | NA | NA |
| 12.01-20 | Tall | NA | NA | NA |
| 6.01-12 | Mid-high | Extremely tall | NA | NA |
| 3.01-6 | Low | Very tall | Extremely tall | NA |
| 1.01-3 | Dwarf | Tall | Tall | Extremely tall |
| 0.51-1 | NA | Low | Mid-high | Tall |
| 0.26-0.5 | NA | Low | Mid-high | Tall |
| <0.25 | NA | Dwarf | Low | Low |

### 3.1.4 Threatened flora

A review of DECC database records identified a number of threatened plant species within the Coffs Harbour map sheet (Table 3).

**Table 3: Threatened plant species listed under the DECC Coffs Harbour Sheet**

| **Common name** | **Scientific name** | **Typical habitat** |
|---|---|---|
| Slender marsdenia | *Marsdenia longiloba* | Subtropical and warm temperate rainforest, moist eucalypt forest |
| Milky silkpod | *Parsonsia dorrigoensis* | Subtropical and warm temperate rainforest, on rainforest margins and in moist eucalypt forest |
| Dwarf heath casuarina | *Allocasuarina defungens* | Grows in tall heath on sand, sandstone or clay soils |
| Square-stemmed spike-rush | *Eleocharis tetraquetra* | Occurs on stream edges and margins of freshwater swamps |
| Narrow-leaf finger fern | *Grammitis stenophylla* | Occurs in moist locations near streams on rocks or in trees |
| Floyd's grass | *Alexfloydia repens* | This species is confined to coastal stands of swamp oak and paperbark in peat-like soil edging the upper tidal areas of mangroves. It has been recorded on the banks of estuarine creeks |
| Austral toadflax | *Thesium australe* | Occurs in grassland or grassy woodland. Often found in damp sites in association with Kangaroo Grass (*Themeda australis*) |
| Moonee Quassia | *Quassia sp.* Mooney Creek | Occurs in the shrub layer under moist and dry eucalypt forest |

## 3.2 Fauna

An assessment of fauna likely to use the site was based on habitat suitability. This assessment included a DECC database review and a review of forestry records known from the Coffs Harbour – Woolgoolga area (refer to Table 4).

**Table 4: Threatened vertebrate species and typical habitat requirements in the Coffs Harbour Shire. Those marked "*" have suitable habitat in the study area**

| Common name | Scientific name | Typical habitat and recorded locations (nth. NSW) |
|---|---|---|
| **Invertebrates** | | |
| Black grass-dart butterfly | *Ocybadistes knightorum* | The black grass-dart is found only in the Coffs Harbour area. It is restricted to areas where its sole food plant, Floyd's Grass *Alexfloydia repens*, occurs. It is confined to coastal stands of swamp oak and paperbark where Floyd's Grass grows edging the upper tidal areas of mangroves |
| **Frogs** | | |
| Giant barred frog | *Mixophyes iteratus* | Moist hardwood forests, Antarctic Beech and rainforests. Relatively common in CHUMA area, being recorded at Kangaroo Creek, Newfoundland SF, Madman's Creek and Waihou Flora Reserves and Oaks, Gladstone, Way Way, Irishman, Orara East, Orara West, Tuckers Knob, Never Never, Ingalba and Wild Cattle Ck State Forests (State Forests 1995) |
| Wallum froglet | *Crinia tinnula* | Swamp forest and banksia heathland. Recorded Tweed Heads, Cudgen, Brunswick Heads, Broken Head, Lennox Head, Broadwater, Ellangowan, Evans Head, Bundjalung, Iluka, Yamba, Brooms Head and Minnie Water (NPWS 1995). Fairly common within Broadwater NP (pers. rec; NPWS database) and extends to Sydney (A. White pers. com) |
| **Birds** | | |
| Barred cuckoo-shrike | *Coracina lineata* | Open eucalypt forest. Mebbin State Forest (State Forests 1996) and in CHUMA (State Forests 1995) |
| Black bittern "*" | *Ixobrychus flavicollis* | Coastal waterways and rivers lined with mangroves and other vegetation. Sparsely distributed along the coast of east and north Australia. |
| Black-necked stork "*" | *Ephippiorhynchus asiaticus* | Riverine swamps, permanent pools and coastal wetlands and estuaries. Sporadically recorded in CHUMA (State Forests 1995). Breeding records from Grafton area (pers. rec.) |
| Brolga | *Grus rubicundus* | Floodplains of the coast and hinterland. An occasional visitor to CHUMA (State Forests 1995) |

## Table 4: Threatened vertebrate species and typical habitat requirements in the Coffs Harbour Shire. Those marked "*" have suitable habitat in the study area

| Common name | Scientific name | Typical habitat and recorded locations (nth. NSW) |
|---|---|---|
| Glossy black cockatoo "*" | *Calyptorhynchus lathami* | Woodland dominated by forest she-oak. Recorded Cudgen, Ellangowan, Evans Head, Iluka, Yamba, Grafton, Minnie Water, and Station Creek (NPWS 1995), Terania Ck, Nullum State Forest, Tweed River, Reserve Ck, Sheep Station Ck, Border Ranges NP, Goonengerry SF (State Forests 1996) |
| Grey-crowned babbler | *Pomatostomus temporalis temporalis* | The grey-crowned babbler is found throughout large parts of northern Australia and in south-eastern Australia. In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Hay (DECC database) |
| Masked owl | *Tyto novaehollandiae* | Forest and woodland. Recorded Tweed Heads (NPWS 1995), Lismore, Broken Head (NPWS 1995), Mt. Warning and Border Ranges NPs and most forests in the Murwillumbah and CHUMA management areas (State Forests 1995; 1996) |
| Osprey "*" | *Pandion haliaetus* | The osprey occurs around the Australian coast line, except for Victoria and Tasmania. It favours the mouths of large rivers, lagoons and lakes and feeds on fish over open water. It breeds from July to September in NSW and nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea |
| Powerful owl | *Ninox strenua* | Old growth forest. Recorded Blackbutt Plateaux, Broadwater, Ellangowan, Iluka (NPWS 1995), Mebbin, Wollumbin, Nullum and Whian Whian SF and in CHUMA (State Forests 1995; 1996) |
| Regent honeyeater | *Xanthomyncha lanceolata* | Dry open forest and woodland, street and garden trees. Coastal distribution in Coffs Harbour region, summer to autumn migrant to SE Queensland |
| Rose-crowned fruit-dove | *Ptilinopus regina* | Rainforests, monsoon and paperbark forests, eucalypt woodlands, vine groves, fruit orchids camphor laurel and broad-leaved privet regrowth. Recorded at Tweed Heads, Brunswick Heads (NPWS 1995), Broken Head Nature Reserve (Holmes 1987; Murray and Baverstock 1991; pers rec.). Also recorded at the Nightcap Ranges, Alstonville, Blackwall Ranges (per. recs; Holmes 1987), Iluka, Yamba and Station Creek (NPWS 1995). |
| Square-tailed kite "*" | *Lophoictinia isura* | Woodland and ecotones. Recorded Tweed Heads (NPWS 1995), Broken Head, Minnie Water (NPWS 1995) and Wollumbin State Forest, Yelgun (State Forests 1996) |
| Swift parrot | *Lathamus discolor* | Mainly breeds in hollow bearing eucalypts in Tasmania during the summer months (Higgins, 1999). Frequents dense clumps or copses of eucalypts, sometimes near water-courses |

## Table 4: Threatened vertebrate species and typical habitat requirements in the Coffs Harbour Shire. Those marked "*" have suitable habitat in the study area

| Common name | Scientific name | Typical habitat and recorded locations (nth. NSW) |
|---|---|---|
| **Mammals** | | |
| Brush-tailed phascogale | *Phascogale tapoatafa* | Dry sclerophyll forest, coastal swamp forest and heaths. Widely distributed throughout Australia but rare regionally and locally (Smith *et al.*, 1994) |
| Koala "*" | *Phascolarctos cinereus* | Forest and woodlands. Recorded at Tweed Heads, Cudgen, Brunswick Heads, Byron Bay, Lennox Head, Ballina, Broadwater, Tuckean, Ellangowan, Evans Head, Iluka, Yamba, Brooms Head, Minnie Water, Station Creek, Red Rock and Moonie Beach (NPWS 1995), Nullum, Whian Whian and Wollumbin SF (State Forests 1996), relatively common in the CHUMA (State Forests 1995) |
| Spotted-tail quoll | *Dasyurus maculatus* | Rainforest, forest and woodlands. Recorded Clarence River (pers. record), Border Ranges NP, Whian Whian SF, Mebbin SF (State Forests 1996) and in the CHUMA (State Forests 1995) |
| Squirrel glider | *Petaurus norfolcensis* | Dry sclerophyll forest and woodland which contain mixed age stands of greater than one eucalypt species. Recorded from the CHUMA (State Forests 1995) |
| Yellow-bellied glider | *Petaurus norfolcensis* | Dry sclerophyll forest and woodland which contain mixed age stands of greater than one eucalypt species. Recorded from the CHUMA (State Forests 1995). |
| Common bent-wing bat "*" | *Miniopteris schreibersii* | Forests, woodlands and coastal heaths. Recorded Ellangowan, Moonee Beach (NPWS 1995) and Whian Whian SF (State Forests 1996). Recorded from a number of forests in the CHUMA (State Forests 1995) |
| Greater broad-nosed bat | *Scoteanax rueppellii* | Forests, woodlands and coastal heathland. Recorded at Tyagarah, Byron Bay, Broken Head (pers. rec.), Tuckean, Yamba (NPWS 1995) and at Murwillumbah, Nimbin and the Border Ranges NP (State Forests 1996). Moderately common in coastal areas but localised. Recorded from the CHUMA (State Forests 1995) |
| Large Footed Myotis "*" | *Myotis adversus* | Riparian habitats, including rivers, estuaries and reservoirs. Brunswick Heads (NPWS 1995), Tyagarah (pers. record), Lennox Head, Bundjalung, Iluka and Yamba (NPWS 1995) and Big Scrub Flora Reserve (State Forests 1996). Relatively common in the CHUMA (State Forests 1995) |
| Little bent-wing bat "*" | *Miniopterus australis* | Forests, woodlands and coastal heaths. Recorded at Tweed Heads, Cudgen, Brunswick Heads, Lennox Head, Broadwater, Tuckean, Ellangowan, Evans Head, Bundjalung, Yamba, Brooms Head, Grafton, Minni Water, Station Creek, Moonee Beach (NPWS 1995), Byron Bay, Suffolk Park, Broken Head, Corindi (pers. records) and recorded from the CHUMA (State Forests 1995) |

**Table 4: Threatened vertebrate species and typical habitat requirements in the Coffs Harbour Shire. Those marked "*" have suitable habitat in the study area**

| Common name | Scientific name | Typical habitat and recorded locations (nth. NSW) |
|---|---|---|
| Common blossom bat "*" | *Synconycteris australis* | Forests, woodlands and coastal heaths. Recorded Ellangowan, Moonee Beach (NPWS 1995) and Whian Whian SF (State Forests 1996). Recorded from a number of forests in the CHUMA (State Forests 1995) |
| Grey-headed flying fox "*" | *Pteropus poliocephalus* | Littoral and subtropical rainforest, mangrove swamps, flood plain rainforests and swamp forests. Reasonably common in north coast habitats, especially when localised at roost sites |

A more detailed explanation of species with suitable habitat in the study area can be found in section 5.4 "Threatened species assessment" commencing at page 34.

# 4.0 RESULTS

## 4.1 Vegetation associations and communities

The Stage 2 development proposal lies within reclaimed mill land resulting from many years of dumping sawmill waste (Plates 4, 5 and 7 at pages 22 and 23). The Parker (2006) survey recorded grassland dominated by the sown species oats and rye, while other areas of grassland supported kikuyu and broad-leaved paspalum, *Paspalum wettsteinii*. In recent years, the oats and rye which were planted as soil conservation measures have largely died out or been out-competed by opportunistic grasses and weeds.

The other differences between the 2006 survey and the present survey is that mill infrastructure has been removed, and lantana, *Lantana camara,* bhana grass, *Pennisetum purpureum,* and other invasive weeds have been removed from the southern bank of Double Crossing Creek and replaced by reafforestation plantings.

**Table 5: Vegetation associations (refer also to Fig. 3)**

| |
|---|
| **Woodland** |
| ○ *Corymbia intermedia* (pink bloodwood), *Eucalyptus pilularis* (blackbutt), ± *Eucalyptus saligna* (Sydney bluegum) mid-high to tall open woodland |
| ○ *Casuarina glauca* (swamp she-oak), blackbutt, ± *Corymbia variegata* (spotted gum) mid-high to tall open woodland |
| **Grassland** |
| ○ *Setaria sphacelata* (canary seed grass), *Sporobolus indicus var. capensis* (Parramatta grass) ± *Pennisetum clandestinum* (kikuyu) low closed grassland |

### 4.1.1 Woodland

| |
|---|
| *Corymbia intermedia* (pink bloodwood), *Eucalyptus pilularis* (blackbutt), ± *Eucalyptus saligna* (Sydney bluegum) mid-high to tall open woodland |

The site has been cleared and used for milling timber for many years. However, woodland remnants occur along the margin of Double Crossing Creek and along the eastern boundary. Woodland was dominated by pink bloodwood and blackbutt.

Plate 1: Woodland remnant (north-west corner) and restoration works (photo taken 2005)

Plate 2: Woodland remnant (north-west corner) today (2009) showing extent of restoration plantings

Plate 3: Swamp she-oak restoration plantings and silt fence adjacent to Double Crossing Creek, 2009

Plate 4: Stage 2 development will be located within land dominated by exotic grasses or little vegetation (see Plate 5)

Plate 5: Un-vegetated cleared land in Stage 2 development site (see Vegetation Map Fig. 3)

Plate 6: Small clumps of sedges colonise moist depressions in otherwise un-vegetated land

Plate 7: Piles of soil and waste will be removed

Plate 8: Silt fence located parallel with proposed wildlife corridor

Plate 9: Silt fences protect Double Crossing Creek , 2009

Plate 10: Woodland north-western corner of site will be preserved within wildlife corridor and creek buffer

Plate 11: The noisy miner dominated woodland vegetation along eastern boundary

Plate 12: Forest and woodland to the west of the site has linked to restoration plantings


**Open woodland**

*Corymbia intermedia* (pink bloodwood), *Eucalyptus pilularis* (blackbutt), +/- *Eucalyptus saligna* (Sydney bluegum) mid-high to tall open woodland

*Casuarina glauca* (swamp she-oak), blackbutt, +/- *Corymbia variegata* (spotted gum) mid-high to tall open woodland

**Grassland**

*Setaria sphacelata* (canary seed grass), *Sporobolus indicus* var. *capensis* (Parramatta grass) *Pennisetum clandestinum* (kikuyu) low closed grassland

Peter Parker

Project: Sandy Beach Mill

## Fig. 3: Vegetation

North

Photo: May 2009 Date: July 2009 Scale m 0 50

Pink bloodwood and blackbutt dominated small areas of woodland near Double Crossing Creek and along the site's eastern boundary. The restoration of woodland along Double Crossing Creek commenced in 2005 and restoration plantings are now well advanced (Plates 1-3).

**Upper storey:**

Blackbutt, blue-gum (recorded in north-west woodland remnant only), pink bloodwood, swamp she-oak, spotted gum, grey ironbark and blackwood

**Mid-strata:**

Pink bloodwood, lantana, wattles, geebung, broad-leaved paperbark and swamp she-oak

**Ground cover**

Lantana, lomandra, small-leaved privet, common ground fern and exotic grasses

| |
|---|
| *Casuarina glauca* (swamp she-oak), blackbutt, ± *Corymbia variegata* (spotted gum) mid-high to tall open woodland |

This mainly floodplain association was recorded along Double Crossing Creek. Swamp she-oak was predominant close to the creek whereas sclerophyll components such as blackbutt and pink bloodwood occurred further up the banks. The floristics of this association fall under the category of an Endangered Ecological Community entitled Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and

South East Corner bioregions. However, its conservation value has been substantially diminished through past clearing and rubbish dumping.

Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions is the name given to the ecological community associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. The Scientific Committee's final determination with respect to this community found that: *"Swamp Oak Floodplain Forest generally occurs below 20 m (rarely above 10 m) elevation in the NSW North Coast, Sydney Basin and South East Corner bioregions. Floodplains are level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less."*

**Upper storey:**

Swamp she-oak ± blackbutt, pink bloodwood and blackwood along margins

**Mid-strata:**

Swamp she-oak, broad-leaved paperbark, and wattles

**Ground cover**

Lomandra and common ground fern

### 4.1.2 Grassland

| |
|---|
| *Setaria sphacelata* (canary seed grass), *Sporobolus indicus* var*. capensis* (Parramatta grass) ± *Pennisetum clandestinum* (kikuyu) low closed grassland |

Approximately half of the site is dominated by exotic grassland the other half being cleared land (Fig. 3).

**Ground cover:**

Canary seed grass, blady grass, whiskey grass, carpet grass, Queensland blue couch, broad-leaved paspalum, paspalum and Parramatta grass

### 4.1.3 Plants of conservation significance

No threatened plant species was recorded or is expected to occur at the site due to the lack of suitable habitat and predominance of exotic grassland.

## 4.2 Fauna

### 4.2.1 Frogs and reptiles

Two frog species, the common froglet, *Crinia signifera,* and red-backed toadlet, *Pseudophryne coriacea*, were recorded. The Wallum froglet was recorded calling from small ponds within the Stage 2 development area and the red-backed toadlet from woodland remnants. Double Crossing Creek is not suitable frog habitat, being tidal and saline. However,

moist depressions and the drainage line along the southern boundary of the site are capable of supporting a number of common frog species such as the striped marsh frog, *Limnodynastes peronii,* the eastern dwarf tree frog, *Litoria fallax* and the rocket frog, *Litoria nasuta*.

Three snake species, the red-bellied blacksnake, *Pseudechis porphyriacus,* the green tree snake, *Dendrelaphis punctulata,* and the eastern water dragon, *Physignathus lesueurii,* were recorded along the bank of Double Crossing Creek in 2006. This habitat is likely to prove ideal for a number of other common reptiles in that ample shelter, foraging areas and connectivity between habitat areas is available. Additional species expected to occur are listed in Appendix 2.

### 4.2.2 Birds

A number of common open country bird species were recorded in 2006, particularly in the woodland association (see Appendix 2: Fauna). These include the grey shrike thrush, *Colluricincla harmonica*, Lewin's honeyeater, *Meliphaga lewinii*, the eastern whipbird, *Psophodes olivaceus*, the scaly breasted lorikeet, *Trichoglossus chlorolepiotus*, the rainbow lorikeet, *Trichoglossus haematodus,* the white-throated honeyeater, *Melithreptus albogularis,* the magpie lark, *Grallina cyanoleuca,* the torresian crow, *Corvus orru,* the welcome swallow, *Hirundo neoxena* and the masked lapwing, *Vanellus miles*.

Small flocks of the noisy miner, *Manorina melanocephala,* dominated woodland remnants along the eastern boundary in the 2009 fauna survey (Plate 11). This species is notorious at repelling other native birds and dominating woodland remnants.

The opportunistic use of the site by threatened bird species is likely to be insignificant due to the negligible habitat available (see section 6: Species Profiles). The DGR's requires particular attention to be given to the osprey. This species was not recorded at the site and no roosting or nesting trees were located either at the site or within 100 m of the site on adjacent land.

### 4.2.3 Mammals

Swamp wallaby, *Wallabia bicolor*, scats were scattered throughout the site during both the 2005 and 2009 surveys and this species is expected to forage extensively on exotic pasture grasses and regrowth shrubs.

A koala assessment was undertaken by searching for scats under forest redgum and swamp mahogany. No evidence of the presence of the koala was recorded although secondary koala habitat has been mapped by Coffs Harbour Shire Council to the east of the site (Fig. 4 at page 31).

The macrochiropteran grey-headed flying fox, *Pteropus poliocephalus,* and a number of small microchiropteran bats

are likely to forage at the site opportunistically, particularly in the riparian corridor along Double Crossing Creek. Suitable roosting sites (e.g., trees hollows) may occur in the older eucalypts in the woodland community to the north of Double Crossing Creek. This habitat within the site has been preserved and reafforestation and weed control measures commenced in 2005. It is proposed to dedicate this high conservation value land to Council.


Secondary koala habitat

Project: Sandy Beach Mill

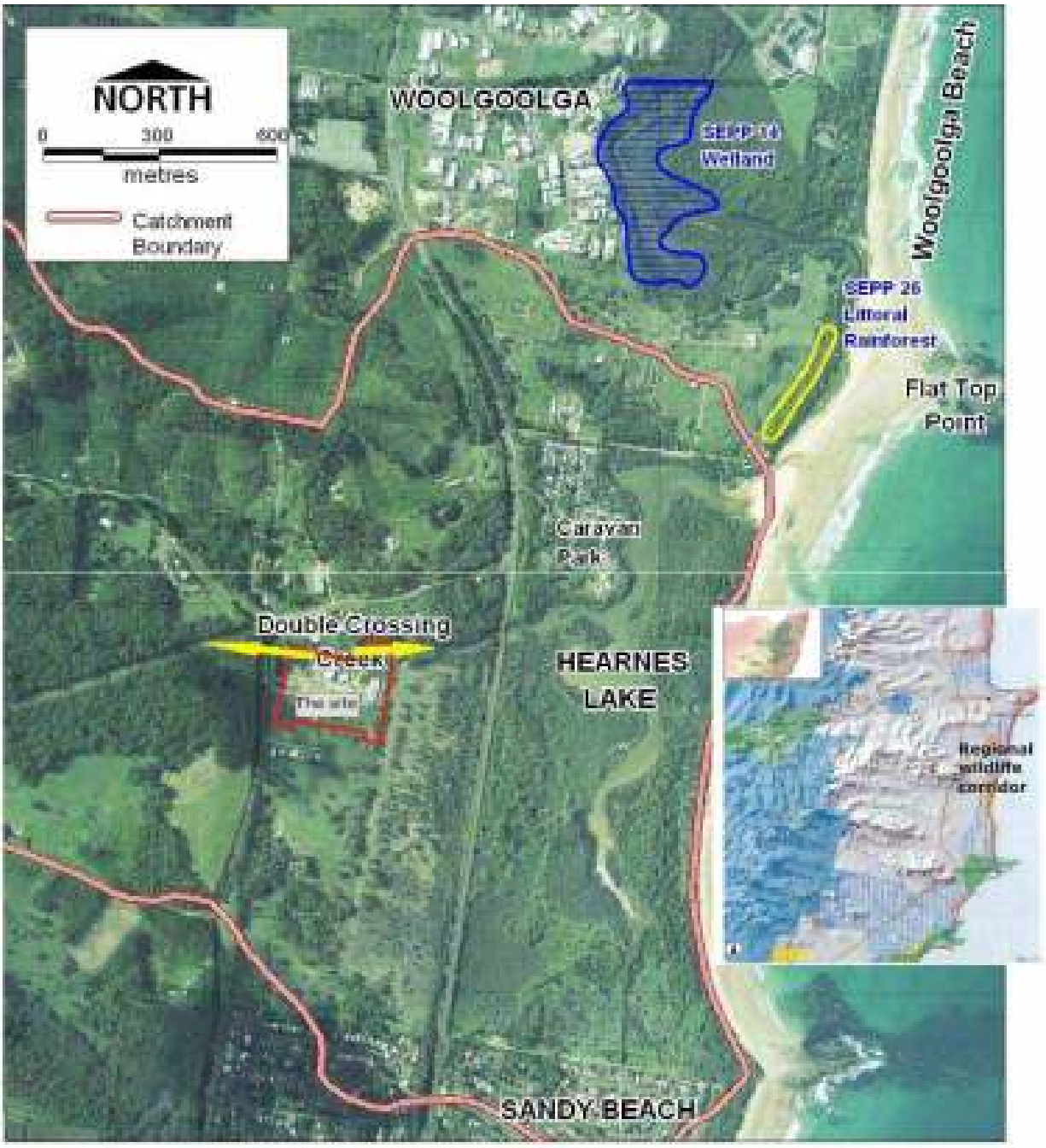
**Fig. 4: Koala habitat mapping**

North

Source: Coffs Harbour Koala Plan of Management

Scale m 0 ——— 50

Peter Parker




Habitat connectivity enhanced through reafforestation and weed control commenced in 2005

Project: Sandy Beach Mill

**Fig. 5: Wildlife Corridors and Hearns Lake**

North

Photo source: Hearns Lake Estuary Management Study and Plan (BHT WBM 2008) and DECC database

# 5.0 DISCUSSION

## 5.1 Habitat connectivity and wildlife corridors

The DECC has mapped regional and sub-regional corridors and key habitats. This information is presented on the NPWS web site:

http://maps.nationalparks.nsw.gov.au/keyhabs/default.htm.

The DECC has identified the north-east of NSW as one of Australia's biodiversity "hot spots" and an area where threats, such as habitat loss and fragmentation, are severe. The Key Habitats and Corridors project has adopted a systematic approach to landscape conservation and identified the site within a regional corridor and a key habitat. A review of this website identified a Regional Corridor east of the site which is illustrated in Fig. 5. Reafforestation measures and habitat linkages are also illustrated in Fig. 5 and photographs are contained in Plates 1-3 and 8. There are no mapped wildlife corridors within or adjacent to the site.

## 5.2 Threatened flora

The impact of the proposal on threatened plant species is negligible as the proposed development is located within cleared land or exotic grassland of little ecological significance. No threatened plant species were recorded or considered

likely to occur within the development footprint due to past land disturbance.

## 5.3 Threatened fauna

A number of threatened species are known from the vicinity of the site. However, no threatened species or threatened species habitat is likely to be impacted by this proposal as it is wholly located on decontaminated mill land which is either lacking in vegetation or supports exotic grasses.

## 5.4 Threatened Species Assessment

The DGR's requires an assessment of *"the potential impact of the development of flora and fauna taking into consideration impacts on any threatened species, populations, endangered ecological communities and/or critical habitat and any relevant recovery plan in accordance with DECC's Guidelines for Threatened Species Assessment (2005), having particular consideration for impacts on the Osprey".* While s.5A of the EPA Act does not apply with respect to Applications assessed under s.3A, s.5A, it is a useful tool to address the relevant DGR's.

### 5.4.1 Terrestrial flora and fauna

**S.5A (a)**

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

The following factors have been considered in assessing the likelihood that a *viable local population* of a species will be placed at risk of extinction from this proposal:

- the proposal's likely impact upon the key habitat components essential to the species' lifecycle; and
- the size of the local population in comparison with that which is proposed to be removed/modified.

A local population is considered to be the population contained within interconnected suitable habitat within a 5 km radius of the study site.

**Flora**

No threatened plant species was recorded or is expected to occur at the site. Thus, it is unlikely that the proposal *would disrupt … a viable local population of* any threatened plant *species* or *that a viable local population of the species is likely to be placed at risk of extinction*.

## Fauna which have essential habitat components at the site

Species profiles for those species listed in Table 4 of this report which have suitable habitat components at or near the site are included below.

### Black bittern

The black bittern frequents streamside vegetation, including mangroves and vegetation along small creeks in forests along Australia's east, north and western coastline ranging from Victoria to the tip of the Cape York peninsula to northern Western Australia. A disjunct population occurs in the south-western corner of Western Australia (RAOU Atlas map 196).

It is a solitary species that predates on small fish and invertebrates. It roosts in trees overhanging water.

This species is affected by clearing of riparian vegetation or its loss through erosion. Other impacts include human disturbance of nesting and roost sites and water pollution. It is unlikely that the proposal will impact on this species as no forested habitat is proposed for clearing. Moreover, reafforestation along Double Crossing Creek is likely to enhance its potential habitat.

### Black-necked stork

The black-necked stork occurs sparsely through much of its northern and north-east Australian range. It is more common

in coastal Northern Territory and along the northern and south-eastern Queensland coast and plains where breeding populations concentrate. Vagrants have been recorded as far south as central Victoria and the NSW South Coast. It also occurs in south-east Asia and India.

This species frequents riverine swamps, large permanent pools, and coastal wetlands and estuaries. The black-necked stork forages in shallow water for small invertebrates, fish, amphibians, reptiles and possibly small mammals (Marchant and Higgins cited in State Forests 1995) and is reported at Hearns Lake in the Hearns Lake Estuary Management Plan and Study. Suitable habitat was not recorded at the site.

**Glossy black-cockatoo**

The glossy black cockatoo occurs in the eastern part of Australia and ranges from Rockhampton, Queensland to southern Victoria. It has also been recorded at islands off the South Australian coast (RAOU Atlas Map 265).

It is a small blackish brown bird with a broad bulbous bill and a low round crest. The female is distinguished from the male by irregular yellowish patterns on the head, crest and/or neck. The female also has a red tail panel edged with yellow which is usually barred black.

The glossy black cockatoo lives in loose groups of two to 20 birds and appears to occupy areas permanently, although

individuals and subgroups may move around within each area. It frequents open forests and woodlands extending into semi-arid areas. This species feeds almost exclusively on the fruits of she-oaks. Swamp she-oak was recorded at the site predominantly along Double Crossing Creek.

The major threat to the survival of the glossy black cockatoo is the clearing of stands of she-oaks in forest and woodland habitat and the loss of nesting sites. This species appears to require large tracts of undisturbed or minimally disturbed woodland with nest hollows and an adequate supply of she-oak seed (Brouwer and Garnett 1990). It will not be affected by this proposal as no potential habitat will be removed.

**Osprey**

The osprey is Australia-wide in distribution, in suitable but limited coastal habitat. However, it has not been recorded breeding south of the Newcastle District and records south of this area are considered dispersing, post-breeding or juvenile birds. The osprey is predominantly confined to coastal estuaries, mangroves and the sea shore in northern NSW. Roosting and nesting sites are located close to estuaries on large trees that provide views over feeding sites. A nest tree was located by the land owner over 100 m east of the site (see location photo below).


Osprey nest tree located and photographed by land owner in land to the east

No foraging opportunities for this species occur at the site and no suitable nest trees were located within the site.

**Square-tailed kite**

The square-tailed kite ranges along the coast and Great Divide from Cape York to eastern Victoria (RAOU Atlas map 230). It also frequents open forests, wetlands, scrub and heathland in the south-west corner of Western Australia. Vagrants are widely dispersed and have been recorded over most of Australia except for the arid regions of eastern Western Australia, central Northern Territory and western South Australia.

The square-tailed kite requires large, mature trees in open eucalypt forest for nesting (CSIRO 1995). It is found in a wide variety of habitats, but has a preference for dry open eucalypt forest (State Forests 1995).

Threats to this species include the clearing of forested habitats, especially old growth hollow-bearing trees. It is

unlikely that the proposal will impact on this species as no suitable habitat will be removed or impacted.

## Mammals

### Koala

The koala is confined to the eastern states. This species extends from coastal and central Queensland through eastern and central NSW, throughout Victoria and to eastern South Australia.

The koala occurs in timbered habitats that contain its essential food needs which are a small guild of eucalypts (55 species). Other tree species, however, are also utilised by the koala. These are of secondary nutrient value and do not replace eucalypt forests and woodlands located on more fertile soils. Koalas have been recorded in regrowth forests, suggesting that young koalas may prefer the new foliage of rapidly growing trees. However, tree preferences are known to change throughout the year when koalas move to different sites (Lee and Martin 1988).

The koala was not recorded at the site. However, it is common in the lower elevation forests within the Shire. It has been regularly recorded in Pine Creek State Forest and less frequently in other forests e.g., Conglomerate, Boambee, Ingalba, Orara, East and Way Way (State Forests 1995).

Secondary koala habitat has been mapped on land to the east (Fig. 4) but few koala food trees occur at the site.

It is unlikely that the proposal will affect this species to any extent as no mapped koala habitat occurs at the site and only secondary habitat is located east of the site.

**Common bent-wing bat**

The common bent-wing bat occurs along the Australian coast and ranges from north Western Australia, the Northern Territory, Cape York to Adelaide (Klippel 1992).

The common or large bent-wing bat is one of the world's most widely dispersed placental mammals. Its distribution extends outside of Australia to Papua New Guinea, south-east Asia, Africa and Eurasia (Klippel 1992). It has an exceptionally long terminal segment of the third finger and its fur is chocolate brown above and paler below. This species is common throughout Australia with population estimates of individuals emerging from roosts at Wee Jasper caves at between 50,000 to 100,000 individuals (Dwyer 1996).

This species forages for flying invertebrate above and beneath the forest canopy. It utilises caves, old mines, or a variety of structures such as buildings and stormwater drains as diurnal roosts. It is typically found in well timbered areas where it forages above the tree canopy on small insects (Dwyer 1983a; 1995). This species will travel large distances

between roost sites according to seasonal and local needs. Adult females congregate in large maternity colonies at specific sites of high temperature and humidity.

This species is threatened by the disturbance of maternity caves by mining, recreational caving or vandalism (Dwyer 1983a; Klippel 1992). It relies on large numbers of individuals congregating at maternity roosts during the breeding season to increase temperatures and humidity to that required for raising young (Baudinette *et al.* 1994). Thus, local populations may also be threatened if a loss of feeding habitat causes the numbers of individuals in roost sites to decrease. This species may occur at the site but will not be impacted by the proposal as no potential habitat will be removed or disturbed.

**Large-footed myotis**

The large-footed myotis has an extensive coastal distribution from south-eastern Australia around the east coast to north Western Australia. It is a small coastal winged placental mammal with grey-brown to dark brown fur above and slightly paler fur below with frosted silver-grey fur on the chest (Cronin 1991).

This species roosts in caves usually located proximal to water and has been reported in colonies ranging from ten to hundreds of individuals. It also roosts in tree-hollows and

dense vegetation (see references cited in State Forests 1996). It has been recorded in mines, tunnels, under bridges, in buildings and in dense foliage. Habitats include rainforests, lakes and reservoirs (Richards 1983a). The large-footed myotis forages over the surface of water on aquatic insects and small fish insects (e.g., water boatmen, grasshoppers, moths and mayflies) (Ferrier *et al.* undated; Robson 1984).

This species is likely to forage along Double Crossing Creek and at Hearns Lake. However, it will not be impacted by the proposal as no potential feeding or roosting habitat will be removed or disturbed.

**Little bent-wing bat**

The little bent-wing bat frequents the coastal ranges of eastern Australia from the central coast of NSW to Cape York. This species utilises caves, old mines and a variety of structures such as buildings and stormwater drains as diurnal roosts.

The little bent-wing bat is characterised by an exceptionally long terminal segment of the third finger. This placental flying mammal is greyish black to fawn-brown above and paler below.

This species occurs in diverse types of forest types ranging from rainforest to warm temperate wet and dry sclerophyll forests. It forages on small insects below the tree canopy of

well timbered habitat and relies on a limited number of caves for maternity and hibernation roosts (Dwyer 1983b). With the onset of spring, adult females move from widely scattered roosts to specific nursery caves. These sites are often shared with the common bent-wing bat. The little bent-wing bat relies on large numbers of common bent-wing bats to raise cave temperatures to that necessary to raise young (Dwyer 1983b; Baudinette *et al.* 1994).

Like the large bent-wing bat, the major threat to the survival of the little bent-wing bat is the disturbance of maternity sites. Maternity caves may be threatened by mining, recreational cavers and vandalism. This species may occur at the site but will not be impacted by the proposal as no potential habitat will be removed or disturbed.

**Common blossom bat**

This species has been recorded east of the ranges from Cape York in Queensland to the mid-north coast of NSW.

The common blossom bat is a small winged placental mammal that feeds on nectar. It has a long thin brush-like tongue and a slim pointed muzzle. Its long soft reddish-brown fur extends to the ankle. It is paler below and flecked with white (Cronin 1991). In suitable environmental conditions, this species can be quite common reaching a density of between 1 and 17.5 bats/ha. However, the species' density is commonly

associated with the density of the *Banksia* inflorescence (Law 1994).

This species forages extensively in coastal heaths and coast banksia woodland and usually roosts in proximity to these feeding sites. In NSW feeding sites, it is considered a strict nectivore, whereas in north-east Queensland it is a facultative frugivore and to a lesser extent a folivore (Law and Spencer 1995). Rainforests, unlike more open habitats, are important for roosting purposes enabling bats to maintain a stable body temperature (Law 1993).

Habitat removal places movement barriers between local populations as well as reducing local nectar supplies. This species will not be impacted by the proposal as no potential habitat will be removed or disturbed. Moreover, the reafforestation of Double Crossing Creek is likely to enhance habitat connectivity.

**Grey-headed flying fox**

This species is distributed along the eastern Australian coastline from Gladstone in Queensland to south Gippsland and Melbourne in Victoria. It rarely travels more than 200 km inland. Large camps occur at Susan Island in the Clarence River and at Wigham Brush, Taree and it is commonly observed throughout the Coffs Harbour Shire, particularly at sunset when departing from roosting sites.

The grey-headed flying fox feeds on the blossom of eucalypts, paperbarks, turpentines and native and introduced fruits.

Clearing of native forests has reduced foraging resources while mortality from powerlines and shooting of bats raiding orchards may pose additional pressures on populations. This species may occur at the site but will not be impacted by the proposal as no potential habitat will be removed or disturbed.

## S5A (a) conclusion

The proposal is unlikely to significantly effect any of the above-listed threatened species as no area of suitable habitat is proposed to be modified or cleared. Moreover, the proposal will not result in an adverse "*effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*"

**S.5A (b)**

*b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised*

No endangered populations, listed under Part 2 of Schedule 1 of the TSC Act occur within the vicinity of the site. Thus, the proposed activity will not disrupt the life cycle of any species

constituting an endangered population and will not significantly compromise the viability of any endangered population.

**S.5A (c)**

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

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

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

The EEC Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions was recorded along Double Crossing Creek. No development is proposed within this community which has been preserved for conservation purposes (refer to Fig. 3).

**S.5A (d)**

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

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

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

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

The proposal will not result in the removal or modification of threatened species habitat or any EEC. In addition, it will not result in habitat fragmentation. Thus, the proposal will have no impact on *the long-term survival of the species, population or ecological community in the locality*.

**S.5A (e)**

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

The site does not contain any area which has been identified and declared as critical habitat under Part 3 of the TSC Act. Therefore, critical habitat will not be affected by the proposal.

**S.5A (f)**

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

No threatened species or EEC will be impacted by this proposal. Thus, no provisions of any of the draft or adopted recovery plans or threat abatement plans apply in this context. Moreover, the protection and conservation of the EEC, the remediation of degraded areas and the improved connectivity which will result from the proposed reafforestation measures are works consistent with the general objectives of recovery planning.

**S.5A (g)**

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

Key threatening processes gazetted in the most recent amendment of the TSC Act are as follows:

- Alteration of habitat following subsidence due to longwall mining;
- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands (as described in the final determination of the Scientific Committee to list the threatening process);

- Anthropogenic climate change;
- Bushrock removal;
- Clearing of native vegetation. Clearing is defined as the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation so as to result in the loss, or long-term modification, of the structure, composition and ecological function of a stand or stands;
- Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus*;
- Competition from feral honey bees, *Apis mellifera*;
- Death or injury to marine species following capture in shark control programs on ocean beaches;
- Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments;
- Forest eucalypt dieback associated with over-abundant psyllids and bell miners;
- Herbivory and environmental degradation caused by feral deer;
- High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition. High frequency fire is defined as two or more successive fires close enough together in time to interfere with or limit the ability of plants or animals to recruit new individuals into a population, or for plants to build up a seed-bank of sufficient size to maintain the population through the next fire;
- Importation of Red Imported Fire Ants, *Solenopsis invicta*;

- Infection by Psittacine Circoviral (beak and feather) disease affecting endangered psittacine species and populations;
- Infection of frogs by amphibian chytrid causing the disease, chytridiomycosis;
- Infection of native plants by the fungus, *Phytophthora cinnamomi*;
- Introduction of the Large Earth Bumblebee, *Bombus terrestris*;
- Invasion and establishment of exotic vines and scramblers;
- Invasion and establishment of Scotch Broom, *Cytisus scoparius*;
- Loss of hollow-bearing trees;
- Loss or degradation (or both) of sites used for hill-topping butterflies. Hill-topping butterflies is a complex behaviour that often facilitates mating between sexes. Many butterfly species appear to congregate on hill-tops or ridges that are usually higher than the surrounding landscape. These sites may range in area from a few square metres to several hectares;
- Invasion, establishment and spread of Lantana;
- Invasion of native plant communities by bitou bush, *Chrysanthemoides monilifera*. The ability of bitou bush to become the overwhelming dominant in invaded ecological communities threatens all plant communities within its distribution;
- Invasion of native plant communities by exotic perennial grasses;
- Predation by the mosquito fish, *Gambusia holbrooki*;

- Predation by the European red fox, *Vulpes vulpes*;
- Predation by the feral cat, *Felix cattus*. Predation by the feral cat has been implicated in the extinction and decline of many species of birds on islands around Australia and in the early extinction of up to seven species of small mammals on the Australian mainland;
- Predation by the ship rat, *Rattus rattus*, on Lord Howe Island; and
- Removal of dead wood and dead trees.

None of the above-listed threatening processes is likely to increase as a result of the proposed development.

### 5.4.2 Fisheries assessment

The *Fisheries Management Act 1994* (FM Act) lists threatened species, marine vegetation and threatening processes. These are as follows:

Critically endangered species

| | |
|---|---|
| *Nereia lophocladia* | Marine brown alga |
| *Carcharias taurus* | Grey nurse shark |
| *Craterocephalus fluviatilis* | Murray hardyhead |
| *Galaxias rostratus* | flathead galaxias |

Endangered species:

| | |
|---|---|
| *Archaeophya adamsi* | Adam's emerald dragonfly |
| *Austrocordulia leonardi* | Sydney hawk dragonfly |
| *Maccullochella ikei Rowland* | Eastern freshwater cod |
| *Maccullochella macquariensis* | Trout cod |
| *Macquaria australasica* | Macquarie perch |

| | |
|---|---|
| *Mogurnda adspersa* | Purple spotted gudgeon |
| *Nannoperca australis* | southern pygmy perch |
| *Nannoperca oxleyana Whitley* | Oxleyan pygmy perch |
| *Notopala sublineata* | River snail |
| *Thunnus maccoyii* | Southern bluefin tuna |

Endangered populations:

- *Ambassis agassizii,* olive perchlet, in western NSW; and
- *Gadopsis marmoratus*, river blackfish, Snowy River population.

Endangered ecological communities:

- The aquatic ecological community in the natural drainage system of the lower Murray River catchment;
- The aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River; and
- The aquatic ecological community in the natural drainage system of the lowland catchment of the Lachlan River.

Vulnerable fish species:

| | |
|---|---|
| *Bidyanus bidyanus* | Silver perch |
| *Branchinella buchananensis* | Buchanan's fairy shrimp |
| *Carcharodon carcharias* | Great white shark |
| *Epinephelus daemelii* | Black cod |

Key threatening processes:

- Degradation of native riparian vegetation along New South Wales water courses;
- Hook and line fishing in areas important for the survival of threatened fish species;
- Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams;
- Introduction of fish to waters within a river catchment outside their natural range;
- Introduction of non-indigenous fish and marine vegetation to the coastal waters of New South Wales;
- Removal of large woody debris from New South Wales rivers and streams; and
- The current shark meshing program in New South Wales waters.

The proposal will not affect any of the above-listed threatened species or result in an increase in any of the listed threatening processes.

**S.5A (a)**

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

No threatened species listed under the FM Act is considered likely to occur in the vicinity of the proposal, based on the fishery surveys undertaken within Hearns Lake, immediately to the east of the site (see records in Malcolm *et al.*, 2005). Thus, the proposal will not *have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction*.

*b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised*

This section relates to endangered populations. No endangered populations occur in the vicinity of the site. Thus, S.5A (b) is not relevant in this circumstance.

**S.5A (c)**

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

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

*(ii) is likely to substantially and adversely modify the composition of the ecological community such that its*

*local occurrence is likely to be placed at risk of extinction,*

The proposal will not have an "*adverse effect on the extent of any ecological community such that its local occurrence is likely to be placed at risk of extinction"* nor will it "*substantially and adversely modify the composition of the ecological community"*.

**S.5A (d)**

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

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

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

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

No modification of threatened aquatic habitat will occur as a result of this proposal. Moreover, buffer plantings, soil erosion measures and weed control along Double Crossing Creek will, over time, enhance water quality in the Hearns Lake Fishery.

**S.5A (e)**

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

The area proposed in this environmental assessment does not include critical habitat.

**S.5A (f)**

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

No recovery plan is relevant to this proposal. However, the reafforestation and remediation of Double Crossing Creek is consistent with the general objectives of recovery planning.

**S.5A (g)**

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

Key threatening processes pursuant to the FM Act are listed above. The proposed development will not lead to an increase of any of these threatening processes.

## 5.5 *Environmental Protection and Biodiversity Conservation Act, 1999* (EPBC Act)

A review of the EPBC Act guidelines was undertaken. Following this review, it is unlikely that the proposal will significantly affect World Heritage properties, wetlands of international importance, listed threatened or endangered species, any endangered community, any listed migratory species, any Commonwealth land or any bilateral agreement between the State and Commonwealth due to the highly degraded nature of the development footprint. Thus, the proposal does not need referral to the Commonwealth.

Australian Government
Department of the Environment, Water, Heritage and the Arts



Protected Matters Search Tool

**EPBC Act Protected Matters Report** 16 July 2009 11:56

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

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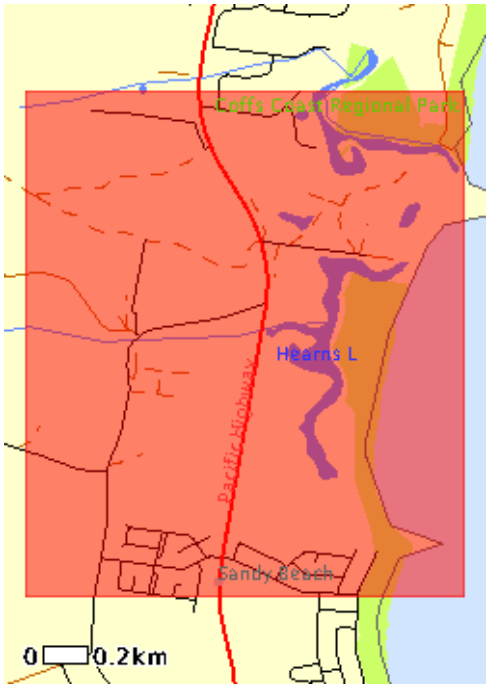




**Search Type:** Area

**Buffer:** 0 km

**Coordinates:** -30.124024,153.182742, -30.148747,153.182742, -30.148747,153.204178, -30.124024,153.204178

**Report Contents:** Summary
Details

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

Caveat
Acknowledgments

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**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:** | None |
| **National Heritage Places:** | None |
| **Wetlands of International Significance: (Ramsar Sites)** | None |
| **Commonwealth Marine Areas:** | None |
| **Threatened Ecological Communities:** | 1 |
| **Threatened Species:** | 34 |
| **Migratory Species:** | 35 |

**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:** | 1 |
| **Listed Marine Species:** | 56 |
| **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:** | 1 |
| **Other Commonwealth Reserves:** | None |
| **Regional Forest Agreements:** | 1 |

**Details**

**Matters of National Environmental Significance**

| Threatened Ecological Communities [ Dataset Information ] | Status | Type of Presence |
|---|---|---|
| Littoral Rainforest and Coastal Vine Thickets of Eastern Australia | Critically Endangered | Community likely to occur within area |
| **Threatened Species [ Dataset Information ]** | **Status** | **Type of Presence** |
| **Birds** | | |
| *Anthochaera phrygia*<br>Regent Honeyeater | Endangered | Species or species habitat likely to occur within area |
| *Diomedea exulans antipodensis*<br>Antipodean Albatross | Vulnerable | Species or species habitat may occur within area |
| *Diomedea exulans gibsoni*<br>Gibson's Albatross | Vulnerable | Species or species habitat may occur within area |

| | | |
|---|---|---|
| *Lathamus discolor*<br>Swift Parrot | Endangered | Species or species habitat may occur within area |
| *Macronectes giganteus*<br>Southern Giant-Petrel | Endangered | Species or species habitat may occur within area |
| *Macronectes halli*<br>Northern Giant-Petrel | Vulnerable | Species or species habitat may occur within area |
| *Pterodroma neglecta neglecta*<br>Kermadec Petrel (western) | Vulnerable | Species or species habitat may occur within area |
| *Rostratula australis*<br>Australian Painted Snipe | Vulnerable | Species or species habitat may occur within area |
| *Thalassarche bulleri*<br>Buller's Albatross | Vulnerable | Species or species habitat may occur within area |
| *Thalassarche cauta cauta*<br>Shy Albatross, Tasmanian Shy Albatross | Vulnerable | Species or species habitat may occur within area |
| *Thalassarche cauta steadi*<br>White-capped Albatross | Vulnerable | Species or species habitat may occur within area |
| *Thalassarche melanophris impavida*<br>Campbell Albatross | Vulnerable | Species or species habitat may occur within area |
| **Frogs** | | |
| *Litoria aurea*<br>Green and Golden Bell Frog | Vulnerable | Species or species habitat may occur within area |
| *Litoria olongburensis*<br>Wallum Sedge Frog | Vulnerable | Species or species habitat likely to occur within area |
| *Mixophyes iteratus*<br>Southern Barred Frog, Giant Barred Frog | Endangered | Species or species habitat likely to occur within area |
| **Mammals** | | |
| *Chalinolobus dwyeri*<br>Large-eared Pied Bat, Large Pied Bat | Vulnerable | Species or species habitat may occur within area |
| *Dasyurus maculatus maculatus (SE mainland population)*<br>Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) | Endangered | Species or species habitat may occur within area |
| *Eubalaena australis*<br>Southern Right Whale | Endangered | Species or species habitat likely to occur within area |
| *Megaptera novaeangliae*<br>Humpback Whale | Vulnerable | Species or species habitat known to occur within area |
| *Petrogale penicillata*<br>Brush-tailed Rock-wallaby | Vulnerable | Species or species habitat may occur within area |
| *Potorous tridactylus tridactylus*<br>Long-nosed Potoroo (SE mainland) | Vulnerable | Species or species habitat may occur within area |
| *Pteropus poliocephalus*<br>Grey-headed Flying-fox | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| **Reptiles** | | |

| | | |
|---|---|---|
| *Caretta caretta*<br>Loggerhead Turtle | Endangered | Breeding known to occur within area |
| *Chelonia mydas*<br>Green Turtle | Vulnerable | Species or species habitat may occur within area |
| *Dermochelys coriacea*<br>Leatherback Turtle, Leathery Turtle, Luth | Endangered | Species or species habitat may occur within area |
| *Emydura macquarii signata (Bellinger River, NSW)*<br>Bellinger River Emydura | Vulnerable | Species or species habitat likely to occur within area |
| **Sharks** | | |
| *Carcharias taurus (east coast population)*<br>Grey Nurse Shark (east coast population) | Critically Endangered | Species or species habitat may occur within area |
| *Carcharodon carcharias*<br>Great White Shark | Vulnerable | Species or species habitat may occur within area |
| *Pristis zijsron*<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish | Vulnerable | Species or species habitat may occur within area |
| *Rhincodon typus*<br>Whale Shark | Vulnerable | Species or species habitat may occur within area |
| **Plants** | | |
| *Marsdenia longiloba*<br>Clear Milkvine | Vulnerable | Species or species habitat likely to occur within area |
| *Phaius australis*<br>Lesser Swamp-orchid | Endangered | Species or species habitat likely to occur within area |
| *Taeniophyllum muelleri*<br>Minute Orchid, Ribbon-root Orchid | Vulnerable | Species or species habitat may occur within area |
| *Thesium australe*<br>Austral Toadflax, Toadflax | Vulnerable | Species or species habitat likely to occur within area |
| Migratory Species [ Dataset Information ] | Status | Type of Presence |
| **Migratory Terrestrial Species** | | |
| **Birds** | | |
| *Haliaeetus leucogaster*<br>White-bellied Sea-Eagle | Migratory | Species or species habitat likely to occur within area |
| *Hirundapus caudacutus*<br>White-throated Needletail | Migratory | Species or species habitat may occur within area |
| *Merops ornatus*<br>Rainbow Bee-eater | Migratory | Species or species habitat may occur within area |
| *Monarcha melanopsis*<br>Black-faced Monarch | Migratory | Breeding may occur within area |
| *Monarcha trivirgatus*<br>Spectacled Monarch | Migratory | Breeding likely to occur within area |
| *Myiagra cyanoleuca*<br>Satin Flycatcher | Migratory | Breeding likely to occur within area |

| | | |
|---|---|---|
| *Rhipidura rufifrons*<br>Rufous Fantail | Migratory | Breeding may occur within area |
| *Xanthomyza phrygia*<br>Regent Honeyeater | Migratory | Species or species habitat likely to occur within area |

**Migratory Wetland Species**

**Birds**

| | | |
|---|---|---|
| *Ardea alba*<br>Great Egret, White Egret | Migratory | Species or species habitat may occur within area |
| *Ardea ibis*<br>Cattle Egret | Migratory | Species or species habitat may occur within area |
| *Gallinago hardwickii*<br>Latham's Snipe, Japanese Snipe | Migratory | Species or species habitat may occur within area |
| *Rostratula benghalensis s. lat.*<br>Painted Snipe | Migratory | Species or species habitat may occur within area |

**Migratory Marine Birds**

| | | |
|---|---|---|
| *Apus pacificus*<br>Fork-tailed Swift | Migratory | Species or species habitat may occur within area |
| *Ardea alba*<br>Great Egret, White Egret | Migratory | Species or species habitat may occur within area |
| *Ardea ibis*<br>Cattle Egret | Migratory | Species or species habitat may occur within area |
| *Diomedea antipodensis*<br>Antipodean Albatross | Migratory | Species or species habitat may occur within area |
| *Diomedea gibsoni*<br>Gibson's Albatross | Migratory | Species or species habitat may occur within area |
| *Macronectes giganteus*<br>Southern Giant-Petrel | Migratory | Species or species habitat may occur within area |
| *Macronectes halli*<br>Northern Giant-Petrel | Migratory | Species or species habitat may occur within area |
| *Sterna albifrons*<br>Little Tern | Migratory | Species or species habitat may occur within area |
| *Thalassarche bulleri*<br>Buller's Albatross | Migratory | Species or species habitat may occur within area |
| *Thalassarche cauta (sensu stricto)*<br>Shy Albatross, Tasmanian Shy Albatross | Migratory | Species or species habitat may occur within area |
| *Thalassarche impavida*<br>Campbell Albatross | Migratory | Species or species habitat may occur within area |
| *Thalassarche steadi*<br>White-capped Albatross | Migratory | Species or species habitat may occur within area |

**Migratory Marine Species**

**Mammals**

| | | |
|---|---|---|
| *Balaenoptera edeni* | Migratory | Species or species habitat may occur |

| | | |
|---|---|---|
| Bryde's Whale | | within area |
| *Caperea marginata*<br>Pygmy Right Whale | Migratory | Species or species habitat may occur within area |
| *Eubalaena australis*<br>Southern Right Whale | Migratory | Species or species habitat likely to occur within area |
| *Lagenorhynchus obscurus*<br>Dusky Dolphin | Migratory | Species or species habitat may occur within area |
| *Megaptera novaeangliae*<br>Humpback Whale | Migratory | Species or species habitat known to occur within area |
| *Orcinus orca*<br>Killer Whale, Orca | Migratory | Species or species habitat may occur within area |
| **Reptiles** | | |
| *Caretta caretta*<br>Loggerhead Turtle | Migratory | Breeding known to occur within area |
| *Chelonia mydas*<br>Green Turtle | Migratory | Species or species habitat may occur within area |
| *Dermochelys coriacea*<br>Leatherback Turtle, Leathery Turtle, Luth | Migratory | Species or species habitat may occur within area |
| **Sharks** | | |
| *Carcharodon carcharias*<br>Great White Shark | Migratory | Species or species habitat may occur within area |
| *Rhincodon typus*<br>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** | | |
| *Apus pacificus*<br>Fork-tailed Swift | Listed - overfly marine area | Species or species habitat may occur within area |
| *Ardea alba*<br>Great Egret, White Egret | Listed - overfly marine area | Species or species habitat may occur within area |
| *Ardea ibis*<br>Cattle Egret | Listed - overfly marine area | Species or species habitat may occur within area |
| *Diomedea antipodensis*<br>Antipodean Albatross | Listed | Species or species habitat may occur within area |
| *Diomedea gibsoni*<br>Gibson's Albatross | Listed | Species or species habitat may occur within area |
| *Gallinago hardwickii*<br>Latham's Snipe, Japanese Snipe | Listed - overfly marine | Species or species habitat may occur within area |

| | | |
|---|---|---|
| | area | |
| *Haliaeetus leucogaster*<br>White-bellied Sea-Eagle | Listed | Species or species habitat likely to occur within area |
| *Hirundapus caudacutus*<br>White-throated Needletail | Listed - overfly marine area | Species or species habitat may occur within area |
| *Lathamus discolor*<br>Swift Parrot | Listed - overfly marine area | Species or species habitat may occur within area |
| *Macronectes giganteus*<br>Southern Giant-Petrel | Listed | Species or species habitat may occur within area |
| *Macronectes halli*<br>Northern Giant-Petrel | Listed | Species or species habitat may occur within area |
| *Merops ornatus*<br>Rainbow Bee-eater | Listed - overfly marine area | Species or species habitat may occur within area |
| *Monarcha melanopsis*<br>Black-faced Monarch | Listed - overfly marine area | Breeding may occur within area |
| *Monarcha trivirgatus*<br>Spectacled Monarch | Listed - overfly marine area | Breeding likely to occur within area |
| *Myiagra cyanoleuca*<br>Satin Flycatcher | Listed - overfly marine area | Breeding likely to occur within area |
| *Rhipidura rufifrons*<br>Rufous Fantail | Listed - overfly marine area | Breeding may occur within area |
| *Rostratula benghalensis s. lat.*<br>Painted Snipe | Listed - overfly marine area | Species or species habitat may occur within area |
| *Sterna albifrons*<br>Little Tern | Listed | Species or species habitat may occur within area |
| *Thalassarche bulleri*<br>Buller's Albatross | Listed | Species or species habitat may occur within area |
| *Thalassarche cauta (sensu stricto)*<br>Shy Albatross, Tasmanian Shy Albatross | Listed | Species or species habitat may occur within area |
| *Thalassarche impavida*<br>Campbell Albatross | Listed | Species or species habitat may occur within area |
| *Thalassarche steadi*<br>White-capped Albatross | Listed | Species or species habitat may occur within area |

**Ray-finned fishes**

| | | |
|---|---|---|
| *Acentronura tentaculata*<br>Hairy Pygmy Pipehorse | Listed | Species or species habitat may occur within area |
| *Campichthys tryoni*<br>Tryon's Pipefish | Listed | Species or species habitat may occur within area |
| *Corythoichthys amplexus*<br>Fijian Banded Pipefish, Brown-banded Pipefish | Listed | Species or species habitat may occur within area |
| *Corythoichthys ocellatus*<br>Orange-spotted Pipefish, Ocellated Pipefish | Listed | Species or species habitat may occur within area |
| *Festucalex cinctus*<br>Girdled Pipefish | Listed | Species or species habitat may occur within area |
| *Filicampus tigris*<br>Tiger Pipefish | Listed | Species or species habitat may occur within area |
| *Halicampus grayi*<br>Mud Pipefish, Gray's Pipefish | Listed | Species or species habitat may occur within area |
| *Hippichthys cyanospilos*<br>Blue-speckled Pipefish, Blue-spotted Pipefish | Listed | Species or species habitat may occur within area |
| *Hippichthys heptagonus*<br>Madura Pipefish, Reticulated Freshwater Pipefish | Listed | Species or species habitat may occur within area |
| *Hippichthys penicillus*<br>Beady Pipefish, Steep-nosed Pipefish | Listed | Species or species habitat may occur within area |
| *Hippocampus kelloggi*<br>Kellogg's Seahorse | Listed | Species or species habitat may occur within area |
| *Hippocampus kuda*<br>Spotted Seahorse, Yellow Seahorse | Listed | Species or species habitat may occur within area |
| *Hippocampus planifrons*<br>Flat-face Seahorse | Listed | Species or species habitat may occur within area |
| *Hippocampus whitei*<br>White's Seahorse, Crowned Seahorse, Sydney Seahorse | Listed | Species or species habitat may occur within area |
| *Lissocampus runa*<br>Javelin Pipefish | Listed | Species or species habitat may occur within area |
| *Maroubra perserrata*<br>Sawtooth Pipefish | Listed | Species or species habitat may occur within area |
| *Micrognathus andersonii*<br>Anderson's Pipefish, Shortnose Pipefish | Listed | Species or species habitat may occur within area |
| *Micrognathus brevirostris*<br>Thorn-tailed Pipefish | Listed | Species or species habitat may occur within area |
| *Microphis manadensis*<br>Manado River Pipefish, Manado Pipefish | Listed | Species or species habitat may occur within area |
| *Solegnathus dunckeri*<br>Duncker's Pipehorse | Listed | Species or species habitat may occur within area |
| *Solegnathus hardwickii*<br>Pipehorse | Listed | Species or species habitat may occur within area |
| *Solegnathus spinosissimus* | Listed | Species or species habitat may occur |

| | | |
|---|---|---|
| Spiny Pipehorse, Australian Spiny Pipehorse | | within area |
| *Solenostomus cyanopterus*<br>Blue-finned Ghost Pipefish, Robust Ghost Pipefish | Listed | Species or species habitat may occur within area |
| *Solenostomus paradoxus*<br>Harlequin Ghost Pipefish, Ornate Ghost Pipefish | Listed | Species or species habitat may occur within area |
| *Stigmatopora nigra*<br>Wide-bodied Pipefish, Black Pipefish | Listed | Species or species habitat may occur within area |
| *Syngnathoides biaculeatus*<br>Double-ended Pipehorse, Alligator Pipefish | Listed | Species or species habitat may occur within area |
| *Trachyrhamphus bicoarctatus*<br>Bend Stick Pipefish, Short-tailed Pipefish | Listed | Species or species habitat may occur within area |
| *Urocampus carinirostris*<br>Hairy Pipefish | Listed | Species or species habitat may occur within area |
| *Vanacampus margaritifer*<br>Mother-of-pearl Pipefish | Listed | Species or species habitat may occur within area |
| **Reptiles** | | |
| *Caretta caretta*<br>Loggerhead Turtle | Listed | Breeding known to occur within area |
| *Chelonia mydas*<br>Green Turtle | Listed | Species or species habitat may occur within area |
| *Dermochelys coriacea*<br>Leatherback Turtle, Leathery Turtle, Luth | Listed | Species or species habitat may occur within area |
| *Hydrophis elegans*<br>Elegant Seasnake | Listed | Species or species habitat may occur within area |
| *Pelamis platurus*<br>Yellow-bellied Seasnake | Listed | Species or species habitat may occur within area |
| Whales and Other Cetaceans [ Dataset Information ] | Status | Type of Presence |
| *Balaenoptera acutorostrata*<br>Minke Whale | Cetacean | Species or species habitat may occur within area |
| *Balaenoptera edeni*<br>Bryde's Whale | Cetacean | Species or species habitat may occur within area |
| *Caperea marginata*<br>Pygmy Right Whale | Cetacean | Species or species habitat may occur within area |
| *Delphinus delphis*<br>Common Dophin, Short-beaked Common Dolphin | Cetacean | Species or species habitat may occur within area |
| *Eubalaena australis*<br>Southern Right Whale | Cetacean | Species or species habitat likely to occur within area |
| *Grampus griseus*<br>Risso's Dolphin, Grampus | Cetacean | Species or species habitat may occur within area |
| *Lagenorhynchus obscurus*<br>Dusky Dolphin | Cetacean | Species or species habitat may occur within area |
| *Megaptera novaeangliae*<br>Humpback Whale | Cetacean | Species or species habitat known to occur within area |

| | | |
|---|---|---|
| *Orcinus orca*<br>Killer Whale, Orca | Cetacean | Species or species habitat may occur within area |
| *Stenella attenuata*<br>Spotted Dolphin, Pantropical Spotted Dolphin | Cetacean | Species or species habitat may occur within area |
| *Tursiops aduncus*<br>Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin | Cetacean | Species or species habitat likely to occur within area |
| *Tursiops truncatus s. str.*<br>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**

Solitary Islands Marine Area NSW

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# APPENDIX 1:

# VEGETATION

| **Scientific name** | **Common name** |
|---|---|
| ** introduced or naturalised* | |
| **FERNS** | |
| CYATHEACEAE | |
| *Cyathea cooperi* | straw treefern |
| DENNSTAEDTIACEAE | |
| *Pteridium esculentum* | bracken |
| DICKSONIACEAE | |
| *Calochlaena dubia* | common ground fern |
| NEPHROLEPIDACEAE | |
| *Nephrolepis cordifolia* | fishbone fern |
| POLYPODIACEAE | |
| *Platycerium bifurcatum* | elk-horn fern |
| **ANGIOSPERMS (Flowering plants)** | |
| **Monocotyledons** | |
| CYPERACEAE | |
| *Carex appressa* | carex |
| JUNCAGINACEAE | |
| *Triglochin striatum* | streaked arrow grass |
| POACEAE | |
| **Andropogon virginicus* | whiskey grass |
| **Axonopus affinis* | broad-leaved carpet grass |
| **Avena sativa* | common oat |
| **Chloris gayana* | Rhode's grass |
| *Digitaria dactyla* | Queensland blue couch |
| *Imperata cylindrica* var. *major* | blady grass |
| **Lolium rigidum* | annual ryegrass |
| **Paspalum urvillei* | paspalum |
| **Paspalum wettsteinii* | broad-leaved paspalum (warrel grass) |
| **Pennisetum clandestinum* | kikuyu |
| **Pennisetum purpureum* | bhana grass |
| *Phragmites australis* | common reed |
| **Setaria sphacelata* | canary seed grass |
| **Sporobolus indicus* var. *capensis* | Parramatta grass |
| TYPHACEAE | |
| *Typha orientalis* | broad-leaved cumbungi |
| APOCYNACEAE | |
| *Parsonsia straminea* | common silkpod |
| ASCLEPIADACEAE | |
| **Gomphocarpus fruiticocus* | narrow-leaf cotton-bush |
| **Ageratina adenophora* | crofton weed |
| **Ageratina riparia* | mist weed |
| **Ageratum houstonianum* | blue billygoat weed |
| **Baccharis halimifolia* | groundsell bush |
| **Biddens pilosa* | cobbler's pegs |
| **Chrysanthemoides monilifera* spp. *rotundata* | bitou bush |
| *Ozothamnus diosmifolium* | white dogwood |

| **Scientific name** | **Common name** |
|---|---|
| ** introduced or naturalised* | |
| **Senecio lautus* | fireweed |
| ** introduced or naturalised* | |
| **Tagetes minuta* | stinking roger |
| CAESALPINIACEAE | |
| **Senna pendula* var. *glabrata* | winter senna |
| CASUARINACEAE | |
| *Casuarina glauca* | swamp she-oak |
| EUPHORBIACEAE | |
| *Glochidion ferdinandii* var. *ferdinandii* | cheese tree |
| FABACEAE | |
| Subfamily FABOIDEAE | |
| ** Erythrina x skyesii* | coral tree |
| *Hardenbergia violacea* | hardenbergia |
| **Macroptilium atropurpureum* | siratro |
| *Pultanea retusa* | blunt bush pea |
| **Trifolium repens* | white clover |
| LAURACEAE | |
| *Cinnamomum camphora* | camphor laurel |
| MIMOSOIDEAE | |
| *Acacia irrorata* subsp. *irrorata* | green wattle |
| *Acacia linifolia* | flat-leaved wattle (introduced) |
| *Acacia longifolia* | Sydney golden wattle |
| *Acacia melanoxylon* | blackwood |
| *Acacia myrtifolia* | myrtle wattle |
| *Acacia saligna* | golden wreath wattle |
| *Acacia suaveolens* | scented wattle |
| *Acacia undulifolia* | a wattle (introduced) |
| MORACEAE | |
| *Ficus fraseri* | sandpaper fig |
| MYRSINACEAE | |
| *Aegiceras corniculatum* | river mangrove |
| MYRTACEAE | |
| *Corymbia variegata (maculata)* | spotted gum |
| *Eucalyptus pilularis* | blackbutt |
| *Eucalyptus robusta* | swamp mahogany |
| *Eucalyptus saligna* | Sydney blue gum |
| *Eucalyptus siderophloia* | grey ironbark |
| *Eucalyptus tereticornis* subsp. *tereticornis* | forest red gum |
| *Lophostemon suaveolens* | swamp turpentine |
| *Melaleuca quinquenervia* | broad-leaved paperbark |
| *Waterhousea floribunda* | weeping lilly pilly |
| OLEACEAE | |
| **Ligustrum lucidum* | large-leaved privet |

| **Scientific name** | **Common name** |
|---|---|
| * introduced or naturalised | |
| PASSIFLORACEAE | |
| **Passiflora edulis* | edible passionfruit |
| PROTEACEAE | |
| *Persoonia stradbrokensis* | geebung |
| RHAMNACEAE | |
| *Alphitonia excelsa* | red ash |
| SAPINDACEAE | |
| *Cupaniopsis anarcardioides* | tuckeroo |
| *Dodonaea triquetra* | hop-bush |
| SOLANACEAE | |
| **Solanum mauritianum* | wild tobacco |
| VERBENACEAE | |
| * *Lantana camara* | lantana |

# APPENDIX 2:

# FAUNA

**Recorded or expected to occur**

| Scientific name | Common name |
|---|---|

* introduced species; # threatened species (TSC Act)

**MAMMALS**

| | |
|---|---|
| CANIDAE | |
| *Canis familaris** | dog |
| *Vulpes vulpes** | fox |
| FELIDAE | |
| *Felis catus** | feral cat |
| LEPORIDAE | |
| *Oryctolagus cuniculus** | rabbit |
| MACROPODIDAE | |
| *Macropus giganteus* | eastern grey kangaroo |
| *Wallabia bicolor* | swamp wallaby |
| MOLOSSIDAE | |
| *Mormopterus sp. 1* | A free-tail bat |
| *Nyctinomus australis* | white-striped mastiff bat |
| MURIDAE | |
| *Hydromys chrysogaster* | water rat |
| *Mus musculus** | house mouse |
| *Rattus fuscipes* | bush rat |
| *Rattus rattus** | black rat |
| PTEROPODIDAE | |
| *Pteropus poliocephalus#* Sch. 2 TSC; Vuln. EPBDCA | grey-headed flying-fox |
| TACHYGLOSSIDAE | |
| *Tachyglossus aculeatus* | short-beaked echidna |
| VESPERTILIONIDAE | |
| sub-family MINIOPTERINAE | |
| *Miniopteris australis#* | little bent-wing bat |
| *Miniopteris schreibersii#* | large bent-wing bat |
| sub-family VESPERTILIONINAE | |
| *Myotis adversus#* | fishing bat |
| *Scotorepens orion* | eastern broad-nosed bat |
| *Scotorepens sp* | broad-nosed bat |
| *Vespadelus pumilus* | eastern forest bat |

**BIRDS**

| | |
|---|---|
| ACCIPITRIDAE | |
| *Haliastur sphenurus* | whistling kite |
| ALCEDINIDAE | |
| *Alcedo azurea* | azure kingfisher |
| *Dacelo novaeguineae* | laughing kookaburra |
| ANATIDAE | |
| *Anas superciliosa* | pacific black duck |

| **Scientific name** | **Common name** |
|---|---|
| * introduced species; # threatened species (TSC Act) | |
| ARDEIDAE | |
| *Egretta garzetta* | little egret |
| *Egretta ibis* | cattle egret |
| *Egretta novaehollandiae* | white-faced heron |
| ARTAMIDAE | |
| *Cracticus nigrogularis* | pied butcherbird |
| *Cracticus torquatus* | grey butcherbird |
| *Gymnorhina tibicen* | Australian magpie |
| *Strepera graculina* | pied currawong |
| CAMPEPHAGIDAE | |
| *Coracina novaehollindiae* | black-faced cuckoo-shrike |
| *Coracina tenuirostris* | cicadabird |
| CAPRIMULGIDAE | |
| *Eurostopodus mystacalis* | white-throated nightjar |
| CHARADRIIDAE | |
| *Vanellus miles* | masked lapwing |
| CLIMACTERIDAE | |
| *Cormobates leucophaea* | white-throated treecreeper |
| COLUMBIDAE | |
| *Columba livia* * | feral pigeon |
| *Geopelia humeralis* | bar-shouldered dove |
| *Macropygia amboinensis* | brown cuckoo-dove |
| *Streptopelia chinensis** | spotted turtle-dove |
| CORACIIDAE | |
| *Eurystomus orientalis* | dollarbird |
| CORVIDAE | |
| *Corvus orru* | torresian crow |
| CUCULIDAE | |
| *Cacomantis flabelliformis* | fan-tailed cuckoo |
| *Centropus phasianinus* | pheasant coucal |
| DICAEIDAE | |
| *Dicaeum hirundinaceum* | mistletoe bird |
| HIRUNDINIDAE | |
| *Hirundo neoxena* | welcome swallow |
| MALURIDAE | |
| *Malurus cyaneus* | superb fairy-wren |
| MELIPHAGIDAE | |
| *Manorina melanocephala* | noisy miner |
| *Meliphaga lewinii* | Lewin's honeyeater |
| *Melithreptus albogularis* | white-throated honeyeater |
| *Myzomela sanguinolenta* | scarlet honeyeater |

| Scientific name | Common name |
|---|---|
| * introduced species; # threatened species (TSC Act) | |
| *Philemon citreogularis* | little friarbird |
| *Philemon corniculatus* | noisy friarbird |
| MEROPIDAE | |
| *Merops ornatus* | rainbow bee-eater |
| MONARCHIDAE | |
| *Dicrurus bracteatus* | spangled drongo |
| *Grallina cyanoleuca* | Australian magpie-lark |
| *Monarcha melanopsis* | black-faced monarch |
| *Rhipidura fuliginosa* | grey fantail |
| *Rhipidura leucophrys* | willie-wagtail |
| ORIOLIDAE | |
| *Oriolus sagittatus* | olive-backed oriole |
| *Sphecotheres viridis* | figbird |
| ORTHONYCHIDAE | |
| *Psophodes olivaceus* | eastern whipbird |
| PACHYCEPHALIDAE | |
| *Colluricincla harmonica* | grey shrike-thrush |
| *Colluricincla megarhyncha* | little shrike-thrush |
| *Eopsaltria australis* | eastern yellow robin |
| *Pachycephala pectoralis* | golden whistler |
| PARDALOTIDAE | |
| *Acanthiza lineata* | striated thornbill |
| *Gerygone olivacea* | white-throated gerygone |
| *Pardalotus striatus* | striated pardalote |
| *Sericornis frontalis* | white-browed scrubwren |
| PLATALEIDAE | |
| *Threskiornis spinicollis* | straw-necked ibis |
| PLOCEIDAE | |
| *Lonchura castaneothorax* | chestnut-breasted mannikin |
| *Neochmia temporalis* | red-browed finch |
| *Taeniopygia bichenovii* | double-barred finch |
| PODARGIDAE | |
| *Podargus strigoides* | tawny frogmouth |
| PSITTACIDAE | |
| *Trichoglossus chlorolepiotus* | scaly-breasted lorikeet |
| *Trichoglossus haematodus* | rainbow lorikeet |
| RALLIDAE | |
| *Gallinula tenebrosa* | dusky moorhen |
| *Porphyrio porphyrio* | purple swamphen |
| ZOSTEROPIDAE | |
| *Zosterops lateralis* | silvereye |

| **Scientific name** | **Common name** |
|---|---|

* introduced species; # threatened species (TSC Act)

**REPTILES**

| | |
|---|---|
| AGAMIDAE | |
| *Gemmatophora muricata* | jacky lizard |
| *Physignathus lesueurii* | eastern water dragon |
| *Pogona barbata* | bearded dragon |
| BOIDAE | |
| *Morelia spilota* | carpet python |
| COLUBRIDAE | |
| *Boiga irregularis* | brown tree snake |
| *Dendrelaphis punctulata* | green tree snake |
| ELAPIDAE | |
| *Pseudechis porphyriacus* | red-bellied blacksnake |
| *Pseudonaja textilis* | eastern brown snake |
| SCINCIDAE | |
| *Eulamprus quoyii* | eastern water skink |
| *Lampropholis delicata* | eastern grass skink |
| VARANIDAE | |
| *Varanus varius* | lace monitor |

**AMPHIBIANS**

| | |
|---|---|
| HYLIDAE | |
| *L. fallax* | eastern dwarf tree frog |
| *L. nasuta* | rocket frog |
| MYOBATRACHIDAE | |
| *Crinia signifera* | common eastern froglet |
| *Limnodynastes peronii* | brown-striped frog |
| *Pseudophryne coriacea* | red-crowned toadlet |