Appendix E

Flora and Fauna Assessment

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A Flora and Fauna Survey of 355 Cudgen Road Cudgen and an Associated Pipeline Route

Prepared for Australian Bay Lobster Producers in Association with David McPhee and Associates

September 2004

CONTENTS

GLOSSARY

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

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

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 TSC Act.

Development: in relation to land, means: 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.

DEC: Department of Environment and Conservation

Ecological community: An assemblage of species occupying a particular area.

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*.

GLOSSARY

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. The purpose of the threat abatement plan is to manage key threatening processes with a view to their abatement, amelioration or elimination.

ROTAP: Rare or threatened Australian plant.

SEPP: State Environmental and Planning Policy.

Significant species: means species not listed under the *Threatened Species Conservation Act 1995* but considered to be of regional or local significance.

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

Subject site: The area which is proposed for development or activity.

Subject species: Those threatened species which are considered known or likely to occur in the study area.

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 A*ct *1995*

Vulnerable species: A species listed under Schedule 2 of the *Threatened Species Conservation Act 1995*

SUMMARY

- This flora and fauna survey was prepared for Australian Bay Lobster Producers and David McPhee and Associates, Consulting Engineers. It forms part of a development application for an aquaculture proposal to be located at 355 Cudgen Road, Cudgen.
- The site is currently used for the cultivation of sugar cane and grazing.
- A pipeline will transport seawater to the site. The pipeline will extend from the South Pacific Ocean at Kingscliff proximal to the Police Station, along a Public/Crown reserve via Marine Parade, Beach Street, Elrond Drive, Chinderah Road, Crescent Street and westward to the site along a proposed new road. A separate pipeline will transport wastewater to the Tweed sewage treatment plant.
- The site exhibited little biological diversity. Vegetation was dominated by sugar cane and environmental weeds. Dominant weeds included blue billygoat weed and canary seed grass. Roadside verges along the pipeline route were also dominated by weeds with few native species being recorded.
- No threatened plant species was recorded or is expected to occur and it is unlikely that threatened fauna species would frequent the site due to the depauperate nature of the existing habitat.
- In terms of the statutory assessment, this study concluded that:

1. No viable populations of threatened species were likely to be placed at risk of extinction by the proposal;
2. The viability of endangered populations will not be significantly compromised;
3. No regionally significant area of known habitat will be removed;
4. No known habitat for threatened species will become isolated;
5. No critical habitat will be affected;
6. The proposed development is not a key threatening process and threatening processes are not likely to increase; and
7. Threatened fauna which may seasonally or opportunistically occur at the site are not at the extreme of their known geographical range.

Pipeline route

Project: Aquaculture | Client: Australian Bay Lobster Producers

Fig. 1: The site and the proposal

North

Source: Australian Bay Lobster Producers | Date: September 2004 | Scale m 0 — 500

Peter Parker

1.0 INTRODUCTION

This flora and fauna survey was prepared for Australian Bay Lobster Producers and David McPhee and Associates. It accompanies a development application for the construction of an aquaculture facility for the production of the Bay Lobster (*Thenus spp*.) known locally as the Moreton Bay Bug. The facility will be based on recirculation aquaculture technology inside horticultural structures with the Bay Lobsters being housed in raceways.

The proposed project site is described as lots 706, 708, 709, 710 DP 1000580; lot 1 DP267742; and lot 1 DP578962, Parish of Cudgen, 355 Cudgen Road, Cudgen, NSW. The site has a total area of approximately 148.5ha, of which 45ha is proposed to be filled and bunded to provide protection from the 1 in 100 year flood event.

The land has an 810 m frontage along the western side of the new Pacific Highway and is accessed by an entrance off the north-western corner of the Murwillumbah overpass.

2.0 PREVIOUS STUDIES

There are a number of previous studies that relate to flora and fauna assemblages in the general area of the proposal. These include:

- Ecograph 1999 *Tweed Vegetation Management Plan*. A draft report to Tweed Shire Council;
- NPWS [now known as the Department of Environment and Conservation ("DEC")], 1995 *Vertebrates of upper north-east New South Wales.* A report by the New South Wales National Parks and Wildlife Service to the Natural Resources Audit Council;
- Parker, P. 1999 *A species impact statement for Reedy Creek Quarry*. A report to GeoLink Pty Limited; and
- 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. NPWS, NSW.

3.0 FIELD SURVEYS

A flora survey and fauna assessment was undertaken at the site on 4 September 2004. Flora transects were undertaken within the grassland, the sugarcane plantation and the adjoining grazing paddock identified for this proposal. A vegetation transect was undertaken along the edge of the sugar cane plantation due to its impenetrable nature and three transects were undertaken in a north-south direction in the grazing paddock (Fig. 1).

A vehicle and walking transect was conducted along the length of the pipeline route from the South Pacific Ocean at Kingscliff proximal to the Police Station, along a Public/Crown reserve via Marine Parade, Beach Street, Elrond Drive, Chinderah Road, Crescent Street and then westward to the site along a proposed new road adjacent to the sugar cane plantation (Fig. 1).

The fauna survey was limited to a habitat assessment both at the site and along the proposed pipeline route and to opportunistic sightings. A systematic trapping survey was unwarranted due to the depauperate nature of habitats at the site (including the pipeline route) and the little likelihood that these habitats would support threatened species. A threatened species database search was conducted.

3.1 Vegetation

3.1.1 Air photo interpretation and field surveys

Vegetation was mapped over a coloured aerial photograph, provided by Australian Bay Lobster Producers, at a scale of approximately

1:4000. Vegetation patterns were ground truthed for accuracy (Fig. 2).

3.1.2 Vegetation classification, structure and floristics

The vegetation classification system adopted for this survey is based on a approach modified from 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).

The following features of the vegetation were noted:

- dominant trees, shrubs and ground covers; and
- plant species in the association (Appendix 1);

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 in 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

3.3 Fauna

3.3.1 Aims

Fauna habitats at the site and along the pipeline route were inspected and the likelihood of threatened species occurring was addressed by using database records and local fauna survey reports (e.g., DEC; Parker 1999) (Table 3).

Table 3: Threatened fauna known from the area and their typical habitat requirements (Source Parker 1999, DEC data base records)

Scientific name	Common name	Habitat and recorded locations in northern NSW
Birds		
Glossy black cockatoo	*Calyptorhynchus lathami*	Woodland dominated by she-oaks. Recorded Cudgen, Ellangowan, Evans Head, Iluka, Yamba, Grafton, Mini Water and Station Creek (NPWS 1995). Terania Ck, Nullum State Forest, Tweed River, Reserve Ck, Sheep Station Ck, Border Ranges NP, Goongerry SF (State Forests 1996) and Kingscliff (per. recs.)
Mammals		
Common blossom bat	*Syconycteris australis*	Coastal heathland and littoral rainforest. Recorded Cudgen, Brunswick Heads (NPWS 1995), Broken Head, Lennox Head (pers rec.), Broadwater, Iluka, Yamba, Brooms Head, Minnie Water, Moonee Beach (NPWS 1995) and Mooball SF, Nullum SF, Mt Warning NP (State Forests 1996)
Black flying fox	*Pteropus alecto*	Littoral and subtropical rainforest, mangrove swamps. Recorded Tweed Heads, Cudgen, Brunswick Heads (NPWS 1995), Byron Bay (pers record), Broadwater, Evans Head (NPWS 1995) and Mebbin SF, rural garden near Murwillumbah (State Forests 1996)
Grey-headed flying fox	*Pteropus poliocephalus*	Forests, woodlands, wetlands, riparian habitats and coastal heathland

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 (pers. recs.) and Mebbin, Nullum, Mooball, Whian Whian and Goongerry SFs (State Forests 1996)

4.0 RESULTS

4.1 Vegetation associations

The site was dominated by grassland comprising of a sugar cane, *Saccarum officinarum,* annual weeds or grasses (e.g., blue billygoat weed, *Ageratum houstonianum*, canary seed grass, *Setaria sphacelata*) and fringed along the new Pacific Highway by a small band of swamp she-oak, *Casuarina glauca* (Fig. 2).

The pipeline route along the roadside verge was also dominated by environmental weeds. However, introduced landscape species combined with paved areas were noted in the Kingscliff Urban environment.

Table 4: Vegetation associations (Fig. 2)

Woodland
Casuarina glauca (swamp she-oak) mid-high to tall open woodland
Grassland
Saccarum officinarum (sugarcane) mid-high to tall closed grassland
Setaria sphacelata (canary seed grass), *Ageratum houstonianum* (blue billygoat weed), *Chloris gayana* (Rhode's grass) mid-high open grassland

4.1.1 Woodland

Casuarina glauca (swamp she-oak) mid-high to tall open woodland

A small band of swamp she-oak screens the site from the new Pacific Highway (Figs. 2 & 3). Trees were clumped and substantial canopy gaps were noted. Invasive ground covers (e.g., molasses grass,

Melinis minutiflora) retarded the regeneration of native plants. The association has limited conservation value which can be enhanced by reafforestation, landscape plantings and weed control.

4.1.2 Grassland

Saccarum officinarum (sugarcane) mid-high to tall closed grassland

Sugarcane has been grown at the site but poor plant strains combined with a reduction in the viability of this rural sector limits its future (Wayne Evans pers. com). Approximately half of the flats at the site remain under cane, the remainder being sown to improved pasture (Rhode's grass and canary seed grass) (Figs. 2 & 3). The area proposed for stages one and two have yet to be planted with improved pastures. The association has little conservation value.

Setaria sphacelata (canary seed grass), *Ageratum houstonianum* (blue billygoat weed), *Chloris gayana* (Rhode's grass) mid-high open grassland

This association is comprised of a mixture of exotic grasses and environmental weeds. The land occupied by this association was recently under sugar cane but remained fallow due to poor returns from cane. The abundant supply of exotic weed seed proliferated to the extent that virtually no native plant was recorded. The association has little conservation value (Figs. 2 & 3).

4.1.3 Plants of conservation significance

No threatened plant species pursuant to the *Threatened Species Conservation Act 1995* (TSC Act) was recorded or is expected to occur either at the site or along the pipeline route.

Site boundary

Swamp she-oak mid-high to tall open woodland

Canary seed grass, blue billygoat weed, Rhode's grass mid-high open grassland

Sugarcane mid-high to tall closed grassland

Peter Parker

Project: Aquaculture

Client: Australian Bay Lobster Producers

Fig. 2: Vegetation

North

Source: Australian Bay Lobster Producers Date: September 2004 Scale m 0 500

Plate 1: sugar cane; location of stage 3

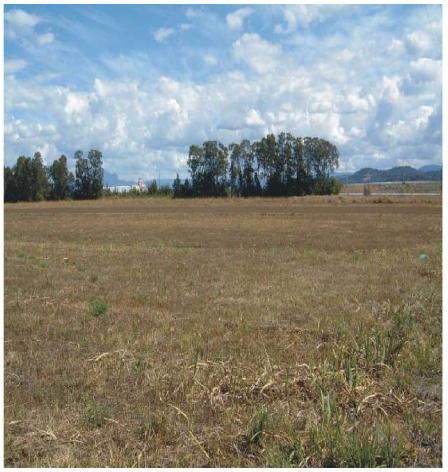

Plate 2: Exotics and grassland; location of stages 1 & 2

Plate 3: pipeline route in vicinity of site

Plate 4: pipeline route adjacent to cane farms (see Fig. 2)

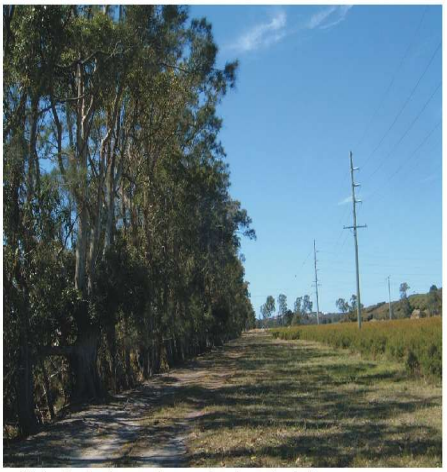

Plate 5: pipeline route near tea tree plantation

Plate 6: pipeline route near sewage treatment plant

Project: Aquaculture

Client: Australian Bay Lobster Producers

Fig. 3: Plates

Peter Parker

Source: Peter Parker

Date: September 2004

4.2 Fauna

4.2.1 Reptiles

Dry weather combined with highly degraded habitat militated against recording reptile density or diversity. However, the eastern grass skink, *Lampropholis delicata* was recorded in roadside vegetation and the water dragon, *Physignathus lesueurii*, was noted in drains near the pipeline route.

Species expected to be attracted to forage on introduced rats and mice in the sugar cane include the brown tree snake, *Boiga irregularis,* and the carpet python, *Morelia spilota* (Appendix 2).

4.2.2 Frogs

A number of frog species may occur in the drain located proximal to the pipeline route, although only the cane toad, *Bufo marinus,* is expected at the site. Frogs known to occur in disturbed and degraded sites include the common froglet, *Crinia signifera,* the striped marsh frog, *Limnodynastes peroni*, and the eastern dwarf tree frog, *Litoria fallax*. It is unlikely that vulnerable species would occur due to the absence of suitable habitat.

4.2.3 Birds

The site supported few open country birds species, although bird assemblages increased and diversified closer to the Tweed sewage treatment plant. Only three open country bird species were recorded at the site further demonstrating its lack of conservation value. These were Richard's pipit, *Anthus novaeseelandiae,* the torresian crow, *Corvus orru* and the welcome swallow, *Hirundo neoxena.* The white-faced heron, *Egretta novaehollandiae,* was noted foraging in the drain adjacent to the pipeline route near the site and a number of species

including the grey fantail, *Rhipidura fuliginosa*, the leaden flycatcher, *Myiagra rubecula*, the grey shrike-thrush, *Colluricincla harmonica,* the white-browed scrubwren, *Sericornis frontalis,* the silvereye, *Zosterops lateralis* and the brown honeyeater, *Lichmera indistincta* were recorded in swamp she-oaks and coast banksias, *Banksia integrifolia* var. *integrifolia* located adjacent to Council's sewage treatment plant.

4.2.4 Mammals

Suitable habitat occurs at the site for a number of common vertebrate fauna (Appendix 2). For example, rabbit, *Oryctolagus cuniculus,* scats were common along the roadside verge in the vicinity of the site and a brown hare, *Lepus capensis*, was sighted near Council's sewage treatment plant.

It is anticipated that the black rat, *Rattus rattus,* and house mouse, *Mus domesticus,* would be common in the cane fields.

Little habitat exists for native mammals, although the water rat, *Hydromys chrysogaster,* may occur in the drainage channel along the roadside edge.

4.2.4.1 Koala habitat

An assessment of potential koala habitat was undertaken pursuant to the requirements of State Environmental and Planning Policy No. 44 (SEPP 44) (Koala Habitat Protection). No koala food trees were recorded at the site and it was concluded that potential koala habitat does not occur.

5.0 DISCUSSION

5.1 Threatened fauna

Threatened species are not expected to utilise the site but several species may fly over the site to access feeding or roosting areas

elsewhere (see Table 3 and Appendix 2). These species habitat requirements are included in the "8 part test" (s.5A assessment) below.

5.2 Environmental management

Some management measures may enhance the environmental values of the site and are compatible with the proposed development. These include:

- the use of locally sourced native plants in landscaping;
- weed control and restoration of the swamp she-oak woodland fronting the new Pacific Highway; and
- buffer plantings between the proposed development and the adjacent cane farms.

6.0 STATUTORY CONSIDERATIONS

The *Threatened Species Conservation Act 1995* ("TSC Act") commenced on 1 January 1996. This Act, *inter alia,* amended s4, s110, s111 and s112 of the *Environmental Planning and Assessment Act*, 1979 with regard to the protection of plants and animals.

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 desktop assessment of threatened plant and animal species likely to use the habitats recorded at the site was undertaken. Species were excluded from the assessment if:

- key habitat components for those species are not present within or near the area under application; and/or
- no records for those species have been recorded within 5 km of the

study site; and/or

- available information on the species precludes it from being considered as likely to use habitat within the area under application because of nesting and/or migratory behaviour.

Section 5A is used to determine whether a proposed development is likely to significantly affect threatened species, populations or ecological communities or their habitats. Section 5A requires the following factors to be taken into account:

S5A(a)

in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

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. Thus, the proposal would not disrupt *a viable local population of* any threatened plant *species.* Similarly, *the life cycle of* any *species is* unlikely *to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction*.

Fauna which are known from the general area and where suitable habitat occurs at the site

Glossy black-cockatoo

The glossy black-cockatoo is the smallest of the black-cockatoos (48 cm). This species is brownish-black and has two bright red (male) or yellow (female) panels in the tail. There are few measures of abundance for this species. However, Morris *et al.* 1981 consider that it is moderately common in northern NSW. It lives in permanent

groups of up to 10 individuals, roosting communally at night and travelling at dawn to groves of seeding she-oaks to feed.

Distribution

Australia

The glossy black-cockatoo ranges from Rockhampton, Queensland to southern Victoria. It has also been recorded at islands off the South Australian coast (RAOU Atlas Map 265). It frequents open forests and woodlands extending into semi-arid areas.

NSW

The glossy black-cockatoo ranges from the Queensland to the Victorian borders extending to the west of the Great Dividing Range. It is widely distributed in the south-east of the State, having been recorded in the Eden State Forest management area (State Forests 1996).

Northern Rivers region

This species has been recorded at Cudgen, Ellangowan, Evans Head, Iluka-Woombah, Yamba and Grafton (NPWS 1995). It was also recorded from 32 locations in the Dorrigo area and from 118 locations in most forest types in the Dorrigo and Grafton State Forest management areas. Moreover, it has been recorded from virtually all State Forest management areas in the north coast region (State Forests 1996).

The study area and surroundings

This species was recorded at various coastal sites during the NRAC survey (NPWS 1995) and during the CSIRO survey of the Murwillumbah State Forest management area. Specific local records include Terania Creek, Nullum State Forest, Tweed River, Reserve Creek, Sheep Station Creek in the Border Rangers National Park,

Laverty's Gap, Cudgen Lake (above Coopers Creek) and at Whian Whian State Forest (State Forests 1996). Thus, it is likely to visit the study area on a seasonal basis when the she-oaks are in fruit.

Critical habitat supporting essential behaviour patterns

This species feeds on the seeds of a few species of she-oaks (e.g., *Allocasuarina torulosa, A. littoralis* and *A. stricta*). It breeds in large tree hollows and is therefore threatened by the gradual loss of forested habitat that contains these essential requirements.

General threats to survival and impacts of the proposal

The major threat to the survival of the glossy black-cockatoo is the loss, through clearing or burning, of she-oaks in forest and woodland habitats. It is unlikely that the proposal will have any impact on this species as its preferred habitat, she-oaks, will be preserved.

Common blossom bat

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). This species can be quite common under suitable environmental conditions and densities of between 1 to 17.5 bats/ha have been recorded (Law 1994).

Distribution

Australia

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

NSW

The common blossom bat occurs along the coastal region east of the Great Dividing Range from the Queensland border to approximately

Taree where littoral rainforest and heath occur in close proximity. Rainforest, unlike more open habitats, is important for roosting purposes enabling bats to maintain a stable body temperature (Law 1993).

Northern Rivers region

The blossom bat has been recorded at Wooyung (Hoye 1994), Kingscliff (Australian Museum), Cudgen, Brunswick Heads (NPWS 1995), Byron Bay and Broken Head (pers. records), Broken Head (Milledge 1991), Lennox Head (NPWS 1995), Iluka Bluff, Bundjalung National Park, Yuraygir National Park (Law 1994), Yamba and Brooms Head (NPWS 1995).

The study area and surroundings

The common blossom bat was not recorded at the study site. However, based on the number of local records, it may periodically fly over the site when suitable food sources in the area are available. It was recorded in Mooball State Forest during the CSIRO fauna survey of the Murwillumbah State Forest management area (State Forests 1996).

Critical habitat supporting essential behaviour patterns

The common blossom bat forages extensively in coastal heaths 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 lessor extent a folivore (Law and Spencer 1995).

General threats to survival and impacts of the proposal

The dominant threat to this species is the clearing of foraging and roosting habitats. Clearing removes essential habitat and places movement barriers between local populations. It is unlikely that the

proposal will have a significant impact on this species as no habitat will be disturbed.

Black flying fox

The black flying-fox is a winged placental mammal with soft dark brown to black fur above which is sometimes reddish-brown on the shoulders and on the back of the neck. It is often flecked with grey below (Cronin 1991). It is the largest of the flying foxes with a head and body length of 24 to 26 cm. Camps of up to several thousand individuals have been recorded in broad-leaved paperbark swamps (Hall 1995). Low numbers occur in northern NSW where it is at the southern limit of its distribution.

Distribution

Australia

The black flying-fox ranges along the Australian coastline north from Shark Bay in Western Australia to include the Northern Territory and Cape York. The southern extreme of its range is approximately Grafton on the NSW coast (Strahan 1992). It feeds on the blossom of eucalypts, broad-leaved paperbark, turpentine and native and introduced fruits (Hall 1983). It often congregates during the day with the grey-headed flying-fox in rainforests or in swamps.

NSW

It has a limited distribution along the NSW coastal zone from the Queensland border to approximately Grafton (Hall 1995).

Northern Rivers Region

This species has been recorded in camps at Susan Island in Grafton and at Curry Park, Lismore. Camps have also been recorded at North Ocean Shores and at Booyong.

The Study Area and Surroundings

It was recorded by the CSIRO in the Murwillumbah State Forest management area at Mebbin State Forest and in a domestic garden in Murwillumbah (State Forests 1996).

Critical habitat supporting essential behaviour patterns

This species is mainly frugivorous, feeding on a range of rainforest fruits (e.g., black apple, *Planchonella australis,* cockspur vine, *Maclura cochinchinensis,* mistletoe, *Notothixos cornifolius* and several species of figs) and non-rainforest species (e.g., broad-leaved paperbark, *Melaleuca quinquenervia* and coast banksia, *Banksia integrifolia* var. *integrifolia*) (McWilliam 1986). Camps are often situated in rainforest, broad-leaved paperbark swamps or mangroves (Hall 1995).

General threats to survival and impacts of the proposal

The main threats to this species appear to be the clearing of native forests. Mortality from powerlines and the shooting of bats raiding orchards may pose additional pressures on populations. It is unlikely that the proposal will have any impact on this species and no foraging or roosting habitat will require removal.

Grey-headed flying fox

Distribution

Australia

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.

NSW

The grey-headed flying fox is distributed along the NSW coastal zone from the Queensland to the Victorian borders.

Northern Rivers Region

Large camps occur at Susan Island in the Clarence River and at Wigham Brush, Taree.

The Study Area and Surroundings

This species is commonly observed throughout coastal shires, particularly at sunset when departing from roosting sites.

Critical habitat supporting essential behaviour patterns

The grey-headed flying fox feeds on the blossom of eucalypts, paperbarks, turpentines and native and introduced fruits. It often congregates during the day with the black flying-fox in swamps or rainforests.

General threats to survival and impacts of the proposal

Clearing of native forests has reduced foraging resources while mortality from powerlines and shooting of bats raiding orchards pose additional pressures on populations. It is unlikely that the proposal will have any impact on this species and no foraging or roosting habitat will require removal.

Little bent-wing bat

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 utilises caves, old mines and a variety of structures such as buildings and stormwater drains as diurnal roosts. 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 1983c). 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 the common bent-wing bats to raise cave temperatures to that necessary to raise young (Dwyer 1983b; Baudinette *et al.* 1994).

Distribution

Australia

The little bent-wing bat frequents the coastal ranges of eastern Australia from the central coast of NSW to Cape York. It is considered abundant nationally (Dwyer 1995)

NSW

This species occurs in north-eastern coastal areas of NSW, extending from the Queensland border to the central coast. Its distribution becomes increasingly coastal towards the southern extreme of its range.

Northern Rivers region

Recorded at Tweed Heads, Cudgen (NPWS 1995), Tumbulgum (pers. record), Brunswick Heads (NPWS 1995), Broken Head (pers. record), Lennox Head, Broadwater, Tuckean, Ellangowan, Evans Head, Bundjalung, Iluka-Woombah (NPWS 1995) Corindi (pers. record) and Grafton (NPWS 1995). It was widely distributed and recorded in most State Forest management areas in northern NSW (State Forests 1996).

The study area and surroundings

This species is known to roost at Nimbin Rocks (State Forests 1996) but is unlikely to roost in the vicinity of the site.

Critical habitat supporting essential behaviour patterns

This species occurs in a wide range of forest types ranging from rainforest to warm temperate wet and dry sclerophyll forests. These forest types were not represented at the site.

General threats to survival and impacts of the proposal

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. However, this species may be indirectly threatened through a drop in bat density and the resultant variation in cave microclimate. Although this species is predominantly cave-roosting, there is at least one record of it roosting in trees (M. Schultz, pers. comm.). Loss of foraging resources by clearing native forest is likely to impose an increasing threat to the survival of this species. It is unlikely that the proposal will have any impact on this species and no foraging or roosting habitat will require removal.

S5A(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.

S5A(c)

in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed

In determining whether a significant area of known habitat is to be modified or removed in relation to the regional distribution of the habitat of a threatened species, population or ecological community,

an assessment needs to consider the following characteristics of the site:

- its relative scale and remnant value;
- its habitat quality; and
- its setting in the landscape at the regional scale.

For the purpose of this assessment "*a region*" is considered to be a bioregion defined in the national system of bioregionisation (see part "f" of this assessment). An area will be considered to contain "*known habitat*" for a species if it is similar to the known habitat preferences of that species and lies within its known range.

The site is arguably one of the most degraded natural landscapes in the Tweed Shire being dominated by environmental weeds. The proposal will not require a *significant area of known habitat* will to *be modified or removed.*

S5A(d)

> *whether an area of habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for threatened species, population or ecological community*

"*Interconnecting or proximate areas of habitat"* are taken to be two or more areas of habitat where individuals could potentially move from one to the other. Areas are considered "*likely to become isolated*" if it is predicted that the proposal creates a situation preventing future movement of individuals between these areas.

In this assessment, consideration is given to the local 'connectivity values' of the site; whether the site is contributing to the local movement patterns of any threatened species and whether the proposal would significantly disrupt these patterns.

The site does not form part of a known fauna movement corridor. Thus, the proposal will not cause *an area of* known fauna habitat to

become isolated from currently interconnecting or proximate areas of habitat.

S5A(e)

whether critical habitat will be affected

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.

S5A(f)

whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region

The Australian Nature Conservation Agency (ANCA) has developed a system of biogeographic regionalisation for Australia (IBRA). This system was developed for the purpose of establishing a national comprehensive system of parks and reserves. A biogeographic region can be defined as *"a complex land area composed of a cluster of interacting ecosystems that are repeated in similar form throughout*" (Thackway and Cresswell 1995). A biogeographic region describes the dominant landscape, scale of climate, lithology, geology, landforms and vegetation. IBRA has been derived through a combination of expert ecological knowledge and interpretation of existing State and Territory regionalisations. On 31 May 1996, the Director General, NPWS gave notice that pursuant to s.4(1) of the *TSC Act* and s.4(6A) of the *EPA Act* 1979, the national system of biogeographic regionalisation, identified by Thackway and Cresswell (1995), "is appropriate for the purposes of the provisions in which the term 'region' is used".

Biogeographic regions provide a framework for summarising patterns in nature conservation. They are an ecologically meaningful approach to defining a region, as they are based upon a conceptual model which seeks to describe and explain a regional pattern of biological diversity and productivity. The north coast region has the IBRA code NNC and the IBRA name *NSW North Coast* (Thackway and Cresswell 1995). In determining the reservation status within this biogeographic region, Thackway and Cresswell (1995) calculated that reserved areas accounted for approximately 5-10% of the total area of the NNC region (60,794 km^2) and that the existing reserves in the region fail to include samples of the most extensive ecosystems (or land systems) i.e. those that characterise entire sub-regions to a "moderate" degree.

Threatened species which may occur seasonally or opportunistically in the locality are wide-ranging and are represented in a number of conservation reserves in the NNC region.

S5A(g)

whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process

A threatening process is defined under the TSC Act as a process that threatens, or may have the capability to threaten the survival or evolutionary development of species, populations or ecological communities.

Threatening processes include the following:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- 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*;
- 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 native plants by the fungus *Phytophthora cinnamomi;*
- Loss or degradation (or both) of sites used for hill-topping by butterflies. Hill-topping in 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 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;
- 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; and
- Predation by the ship rat *Rattus rattus* on Lord Howe Island.

In relation to the above:

- The proposal will not alter the natural flow regimes of rivers or streams;
- Anthropogenic climate change is unlikely to occur due to the small scale of the proposal;
- Bushrock will not be removed from the site;
- Clearing of native vegetation: Clearing as defined by the Scientific Committee is not required;
- The proposal will not contribute to an increase in fire frequency;
- The proposal will not increase competition and grazing by the feral European Rabbit;
- The proposal will not increase the competition from feral honey bees;
- The proposal will not result in the importation of Red Imported Fire Ants;
- The proposal will not increase infection by *Psittacine Circoviral* disease affecting endangered psittacine species and populations.
- The proposal will not increase the infection of native plants by *Phytophthora cinnamomi*;
- Loss or degradation of sites used for hill-topping by butterflies. The survey did not reveal the use of the site by hill-topping butterflies;
- Bitou bush was recorded. However, the proposal will not alter the impact of bitou bush on native plant communities;
- The mosquito fish was not recorded and is unlikely to occur at the site due to the lack of fish habitat;
- The fox was not recorded although it is known from the local area. The proposal is unlikely to alter the density of this species;
- The feral cat was not recorded at the site and the proposal is unlikely to alter the density of this species; and
- The Lord Howe Island Ship rat does not occur at the site. Thus, the proposal will not impact on this species.

S5A(h)

whether any threatened species, population or

ecological community is at the limit of its known distribution

No threatened species at the site is at the limit of its known distribution.

6.1 Section 5A, conclusion

Based on available information:

- No viable populations of the species detailed under (a) are likely to be placed at risk of extinction;
- The viability of endangered populations will not be significantly compromised;
- No regionally significant area of known habitat will be removed;
- No known habitat for threatened species will become isolated;
- No critical habitat will be affected;
- The occasional use of the site by threatened species is likely to be limited to those which opportunistically fly over to access foraging sites elsewhere. These species are represented in nearby national parks or nature reserves;
- The proposed development is not a key threatening process under Schedule 3 of the TSC Act, and threatening processes listed under the TSC Act are not likely to increase; and
- No threatened species which may opportunistically occur at the site is at the limit of its known distribution;

6.2 *Environmental Protection and Biodiversity Conservation Act, 1999*

Under the Environment *Protection and Biodiversity Conservation Act,* 1999 ("EPBC Act"), an action will require approval from the Federal Minister for the Environment ("the Minister") if:

- The action has, will have, or is likely to have a significant impact on a matter of national environmental significance; and
- The action is not subject to one of the exceptions identified below.

The matters of national environmental significance are:

- World Heritage properties;
- RAMSAR wetlands of international importance;
- Listed threatened species and communities;
- Migratory species protected under international agreements;
- Nuclear actions; and
- The Commonwealth marine environment.

If a proposed action is not covered by one of the exceptions identified below under heading 6.2.2, a person proposing to take an action that he or she thinks will have, or is likely to have, a significant impact on a matter of national environmental significance must refer that action to the Minister.

The Minister will decide whether the action will, or is likely to, have a significant impact on a matter of national environmental significance. If the Minister decides that the action is likely to have a significant impact on a matter of national environmental significance, then the action requires approval under the EPBC Act. If the Minister decides that the action is not likely to have a significant impact on a matter of national environmental significance, then the action does not require approval under the Act.

The Minister is generally required to make a binding decision on whether an action requires approval within 20 business days of receiving a referral (in some cases the decision must be made within 10 business days). If the Minister's decision is that an action does not require approval, a person will not contravene the Act if the action is taken in accordance with that decision.

If the Minister decides that an action requires approval, then an environmental assessment of the action must be carried out. The Minister decides whether to approve the action, and what conditions (if any) to impose, after considering the environmental assessment.

6.2.1 Determining whether an action is likely to have a significant impact

The criteria intended to assist in determining whether the impact of an action on any matter of national environmental significance is likely to be significant are as follows:

- On-site and offsite impacts;

- Direct and indirect impacts;
- The frequency and duration of the action;
- The total impact which can be attributed to that action over the entire geographic area affected and over time;
- The sensitivity of the receiving environment; and
- The degree of confidence with which the impacts of the action are known and understood.

The EPBC Act provides that the Minister must, in deciding whether an action is likely to have a significant impact on a matter of national environmental significance, take account of the precautionary principle.

The EPBC Act provides that in deciding whether the action is a controlled action, the Minister must not consider any beneficial impacts that the action has, will have or is likely to have.

6.2.2 Exceptions

An action does not require approval from the Minister under the Act if:

- The action is approved under, and taken in accordance with, a State management plan that is accredited by the Commonwealth for the purposes of a bilateral agreement (see section 46 of the Act), or
- The action is approved under, and taken in accordance with, a Commonwealth management plan that is accredited by the Minister for the purposes of a Ministerial declaration (see section 33 of the Act), or
- The action is a forestry operation taken in a Regional Forest Agreement region (see Part 4, Division 2 of the Act), or
- The action is taken in the Great Barrier Reef Marine Park and is authorised by certain instruments issued under the Great Barrier Marine Park Act 1975 (see section 43 of the Act), or
- The action has been authorised by a Government decision on which the Minister's advice has been sought (see section 160 of the Act), or
- The action was authorised by the Commonwealth, a State or a Territory prior to the EPBC Act commencing (16 July 2000); and
- At the time the EPBC Act commenced, no further authorisation is required to allow the action to be lawfully taken.

Finally, the EPBC Act provides that approval is not required for an action that is a lawful continuation of a use of land, sea or seabed that was occurring immediately before the commencement of the Act (This exception does not apply to an enlargement, intensification or expansion of an existing use).

6.2.3 Conclusion

On a review of the above, the subject proposal does not significantly affect World Heritage values (Part 3 Divn. 1 EPBC Act), wetlands of international importance, listed threatened or endangered species, any endangered community, any listed migratory species, any Commonwealth land and any bilateral agreement between the State and Commonwealth. Thus, the proposal does not need referral to the Commonwealth.

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APPENDIX 1:

VEGETATION

Scientific name	Common name	Recorded at site	Recorded at or near pipeline route
ANGIOSPERMS (Flowering plants)			
Monocotyledons			
COMMELINACEAE			
Commelina cyanea	scurvy weed	x	
CYPERACEAE			
Baumea articulata	jointed twig-rush	x	
**Cyperus eragrostis*	umbrella sedge	x	
PHILYDRACEAE			
Philydrum lanuginosum	woolly frogmouth	x	
POACEAE			
**Axonopus affinis*	broad-leaved carpet grass	x	x
**Chloris gayana*	Rhode's grass	x	
Cynodon dactylon	couch	x	x
**Eragrostis curvula* (complex)	love-grass	x	x
**Melinis minutiflora*	molasses grass	x	
**Paspalum wettsteinii*	broad-leaved paspalum (warrel grass)	x	x
Phragmites australis	common reed	x	
**Saccarum officinarum*	sugar cane	x	
**Setaria sphacelata*	canary seed grass	x	x
**Sorghum bicolor*	sorghum	x	
Spinifex sericeus	hairy spinifex	x	
**Stenotaphrum secundatum*	buffalo grass	x	
Dicotyledons			
APOCYNACEAE			
Parsonsia straminea	common silkpod	x	
ASTERACEAE			
**Ageratum houstonianum*	blue billygoat weed	x	
**Ambrosia psilostachya*	perennial ragweed	x	
**Biddens pilosa*	cobbler's pegs	x	x
**Ceratogyne australis*	carrot weed	x	
**Cirsium vulgare*	spear thistle	x	
**Crassocephalum crepidioides*	thickhead	x	
**Chrysanthemoides* spp. *rotundata monilifera*	bitou bush		x

**Conyza albida*	tall fleabane	x	x
**Erigeron bonariensis*	fleabane	x	
**Senecio lautus*	fireweed	x	x
CAPPARIDACEAE			
Capparis arborea	brush caper berry		x
CASUARINACEAE			
Casuarina glauca	swamp she-oak	x	
CONVOLVULACEAE			
** Ipomea cairica*	coast morning glory	x	x
** Ipomea indica*	blue morning glory		x
EUPHORBIACEAE			
Macaranga tanarius	macaranga	x	
**Ricinus communis*	castor oil plant	x	
FABACEAE			
Subfamily FABOIDEAE			
**Macroptilium atropurpureum*	siratro	x	x
**Trifolium repens*	white clover	x	x
LAURACEAE			
**Cinnamomum camphora*	camphor laurel	x	
MALVACEAE			
Hibiscus heterophyllus	native Rosella	x	
**Sida rhombifolia*	Paddy's Lucerne	x	x
OXALIDACEAE			
**Oxalis* sp.	oxalis	x	x
PLANTAGINACEAE			
**Plantago gaudichaudii*	narrow-leaf plantain	x	x
POLYGONACEAE			
**Rumex brownii*	swamp dock	x	
SALVINIACEAE			
**Salvinia molesta*	salvinia	x	
SAPINDACEAE			
Cupaniopsis anarcardioides	tuckeroo	x	
SOLANACEAE			
**Solanum mauritianum*	wild tobacco	x	
VERBENACEAE			
** Lantana camara*	lantana	x	x
**Verbena bonariensis*	purple top	x	

APPENDIX 2:

FAUNA

SCIENTIFIC NAME	COMMON NAME	RECORDED AT SITE OR NEAR PIPELINE ROUTE	EXPECTED
* introduced species; # threatened species (TSC Act)			
MAMMALS			
CANIDAE			
*Canis familaris**	Dog	x	x
*Vulpes vulpes**	Fox		x
FELIDAE			
*Felis catus**	feral cat		x
LEPORIDAE			
*Lepus capensis**	brown hare		x
*Oryctolagus cuniculus**	Rabbit	x	x
MOLOSSIDAE			
Mormopterus sp.1			x
Nyctinomus australis	white-striped mastiff bat		x
MURIDAE			
Hydromys chrysogaster	water rat		x
*Mus domesticus**	house mouse		x
*Rattus rattus**	black rat		x
PERAMELIDAE			
Isoodon macrourus	northern brown bandicoot		x
PTEROPODIDAE			
Pteropus alecto#	black flying-fox		x
Pteropus poliocephalus# Sch. 2 TSC; Vuln. EPBDCA	grey-headed flying-fox		
Syconycteris australis #	Queensland blossom-bat		x
TACHYGLOSSIDAE			
Tachyglossus aculeatus	short-beaked echidna		x
VESPERTILIONIDAE			
sub-family MINIOPTERINAE			
Miniopteris australis#	little bent-wing bat		x
sub-family NYCTOPHILINAE			
Nyctophilus gouldi	Gould's long-eared bat		x
sub-family VESPERTILIONINAE			

Chalinolobus gouldii	Gould's wattled bat		x
Chalinolobus morio	chocolate wattled bat		x
Scotorepens orion	eastern broad-nosed bat		x
Scotorepens sp	broad-nosed bat		x
Vespadelus pumilus	the eastern forest bat		x
BIRDS			
ACCIPITRIDAE			
Aquila audax	Wedge-tailed eagle		x
Elanus axillaries	black-shouldered kite		x
Haliastur sphenurus	whistling kite		x
ALCEDINIDAE			
Alcedo azurea	azure kingfisher		x
Dacelo novaeguineae	laughing kookaburra		x
ANATIDAE			
Anas castanea	chestnut teal		x
Anas superciliosa	Pacific black duck		x
ARDEIDAE			
Egretta garzetta	little egret		x
Egretta ibis	cattle egret		x
Egretta intermedia	intermediate egret	x	x
Egretta novaehollandiae	white-faced heron	x	x
ARTAMIDAE			
Cracticus nigrogularis	pied butcherbird		x
Cracticus torquatus grey	butcherbird		x
Gymnorhina tibicen	Australian magpie		x
Strepera graculina	pied currawong		x
CAMPEPHAGIDAE			
Lalage leucomela	varied triller	x	x
CHARADRIIDAE			
Vanellus miles	masked lapwing		x
COLUMBIDAE			
Columba livia *	feral pigeon		x
Geopelia humerali	bar-shouldered dove		x
Geophaps lophotes	crested pigeon		x
CORACIIDAE			
Eurystomus orientalis	dollarbird		x

CORVIDAE			
Corvus orru	torresian crow	x	x
HIRUNDINIDAE			
Hirundo neoxena	welcome swallow	x	x
MALURIDAE			
Malurus cyaneus	Superb fairy-wren	x	x
MELIPHAGIDAE			
Lichmera indistincta	brown honeyeater	x	x
Manorina melanocephala	noisy miner		x
Meliphaga lewinii	Lewin's honeyeater		x
MEROPIDAE			
Merops ornatus	rainbow bee-eater		x
MONARCHIDAE			
Grallina cyanoleuca	Australian magpie-lark	x	x
Myiagra rubecula	Leaden flycatcher	x	x
Rhipidura fuliginosa	grey fantail	x	x
MOTACILLIDAE			
Anthus novaeseelandiae	Richard's pipit	x	x
PACHYCEPHALIDAE			
Colluricincla harmonica	grey shrike-thrush	x	x
PARDALOTIDAE			
Sericornis frontalis	white-browed scrubwren	x	x
PLATALEIDAE			
Threskiornis molucca	Australian white ibis		x
Threskiornis spinicollis	straw-necked ibis	x	x
PLOCEIDAE			
Neochmia temporalis	red-browed finch		x
Taeniopygia bichenovii	Double-barred finch	x	x
ZOSTEROPIDAE			
Zosterops lateralis	silvereye	*x*	x
REPTILES			
AGAMIDAE			
Physignathus lesueurii	eastern water dragon	x	x
Pogona barbata	bearded dragon		x
BOIDAE			
Morelia spilota	Carpet python		x
COLUBRIDAE			
Boiga irregularis	brown tree snake		x

Dendrelaphis punctulata	green tree snake		x
ELAPIDAE			
Demansia psammophis	yellow-faced whip snake		x
Pseudonaja textiles	eastern brown snake		x
SCINCIDAE			
Lampropholis delicata	eastern grass skink	x	x
AMPHIBIANS			
BUFONIDAE			
*Bufo marinus**	cane toad		x
MYOBATRACHIDAE			
Crinia signifera	common eastern froglet		x
Limnodynastes peronii	brown-striped frog		x