Federal Airports Corporation

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THIRD RUNWAY PROPOSAL

SYDNEY (KINGSFORD SMITH) AIRPORT

ENVIRONMENTAL IMPACT STATEMENT

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TERRESTRIAL FLORA AND FAUNA: DESCRIPTION OF THE EXISTING TERRESTRIAL BIOLOGICAL ENVIRONMENT

DRAFT WORKING PAPER

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P R O P O S E D T H I R D R U N W A Y

S Y D N E Y (K I N G S F O R D S M I T H) A I R P O R T

WORKING DRAFT - TERRESTRIAL FLORA AND FAUNA

REPORT 1: DESCRIPTION OF THE EXISTING TERRESTRIAL BIOLOGICAL ENVIRONMENT

by

M O U N T K I N G E C O L O G I C A L S U R V E Y S

10 January, 1990

~~22 December, 1989~~

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PROPOSED THIRD RUNWAY - SYDNEY (KINGSFORD SMITH) AIRPORT

DRAFT WORKING PAPER

REPORT 1: DESCRIPTION OF THE EXISTING TERRESTRIAL BIOLOGICAL ENVIRONMENT

by

MOUNT KING ECOLOGICAL SURVEYS

1.Ø GENERAL BACKGROUND

On 22 March 1989 the Commonwealth Government announced that it had decided to develop a third runway at Sydney (Kingsford Smith) Airport, subject to it being satisfied at the completion of normal Environmental Impact Statement processes that there will be no unacceptable environmental effects.

The runway will be located up to 1,Ø5Ø metres to the east of and parallel to the existing main north-south runway and west of Foreshore Road. As with the southern end of the existing north-south runway, it will be constructed on a peninsula of reclaimed land extending into Botany Bay. It will be up to 2,4ØØ metres in length with a runway strip approximately 3ØØ metres wide.

Seawall construction will be needed along the perimeter of the reclaimed land area. A similar seawall to that around the existing north-south runway is proposed, consisting of layers of coarse material ranging from crushed rock to substantial basalt rock armour to protect against erosive wave action. Some filling of the Bay between the new runway and the existing north-south runway will be necessary and an extension of the bridging across General Holmes Drive will be required to provide for the construction of taxiways to link the runway with the rest of the airport system.

The third runway will be capable of facilitating landings and take-offs in conjunction with operations on both the existing runways, and it is suggested that the proposed runway will increase the capacity of Sydney Airport by at least one third [Federal Airports Corporation, 1989].

Mount King Ecological Surveys have been commissioned to undertake terrestrial flora and fauna studies of that area of Botany Bay affected by the proposal. The objectives of the flora and fauna study are to:

* assess the impact of construction and operation of a third runway at Sydney Airport on the diverse flora and fauna of Botany Bay and its associated wetlands;

* assess the potential loss of vegetation and wildlife habitat;

* assess the potential for increased bird strikes;

* assess the potential for increased disturbance of nesting and feeding populations of birds.

Because of the size and importance of the project, the terrestrial flora and fauna studies by Mount King Ecological Surveys are presented as three reports. These reports comprise:

1. **Description of Existing Environment.**

2. **Impacts Upon the Existing Environment - Assessment and Mitigation.**

3. **Bird Strike - Assessment and Mitigation.**

This report is Number 1: Description of Existing Terrestrial Biological Environment.

2.Ø STUDY AREA

2.1 Definition of Study Area

Although the actual area directly affected by the construction of the third runway is relatively small, some of the effects from this development could be more widespread. Consequently, it is imperative to define the area's boundaries for the purpose of this study.

The vegetation described in this report is that which occurs within the existing airport boundaries, the proposed area of construction of the third runway i.e. the foreshores of Botany Bay near Foreshore Road, and part of the Mill Ponds area. The last part of the study area i.e. Mill Ponds, is included as the construction of the runway could affect part of the Mill Ponds system, particularly the Engine Pond.

The study area for fauna is larger; as well as the area used in the vegetation description, a large part of Botany Bay must be included. The increased movements of planes across Botany Bay as a consequence of the construction of the third runway may have some effect upon bird populations using the Bay. Consequently,

the study area for fauna is defined as that containing the existing airport, the future runway area, the northern foreshores of Botany Bay, the Mill Ponds near Botany, and part of the open waters of the Bay near the airport. It was felt that the southern shores of Botany Bay e.g. Towra Point, were sufficiently remote from the development not to be significantly affected. However, seabird use of Botany Bay covers a wide area, so that information about faunal use of the southern parts of Botany Bay and Cooks River will be taken into account during this and the other reports.

2.2 Botany Bay Region

Botany Bay comprises a shallow, roughly circular body of water approximately 7 to 8 km in diameter. It is deepest at the entrance which is dredged to aid the passage of large container ships and tankers. Here the water is 21 metres deep, but the average depth in the Bay is about 5 metres. The catchment area for Botany Bay is 113,38Ø hectares, with two major rivers [Georges and Cooks Rivers] draining into the Bay. Forty percent of the catchment is forested and reserved as parks etc, 3Ø% is residential land, 2Ø% is farmed and 1Ø% is used by industry [McGuinness, 1988].

The northern shores of Botany Bay are formed by a bedrock headland of Hawksbury sandstone in the north-east which is covered by alluvial sediments and Holocene sand dunes. These alluvial and sand deposits are associated with the swamp systems found near Botany, Eastlakes and Centennial Park [Mill Ponds, Lachlan Swamps] and contain a large groundwater aquifer. Other areas of wetland occur along the edges of Cooks River and it's tributaries e.g. Wolli Creek, although many of these have been reclaimed [Nature Conservation Council, 1989] Much of the original nature of the northern shores of Botany Bay have been changed due to road and airport construction, residential and industrial development and recreational use e.g. golf courses, and it is difficult to describe any area of land in the immediate study area as "natural". However, there are several areas within the northern part of Botany Bay that are considered of conservation importance because of their remnant quality and/or because they support plant and animal species of high conservation value, either at a local, regional or international level. This aspect will be taken up in the assessment of the existing environment.

3.Ø METHODOLOGY

3.1 Vegetation Surveys

The vegetation within the area defined for this study [see Section 2.1] was surveyed and described using three methods:

1. Literature Review. There is a considerable amount of information available about the vegetation in the Botany Bay region and particulalry in the study area. Information from studies by Adam et al [1988], by Wilson [1984] and by Mitchell and Adam [1989] of the saltmarsh vegetation, by Benson [1985] of the vegetation of the Botany Swamps and by Travers Morgan Pty Ltd [1986] of the Mill Ponds area were used in the description and assessment of the vegetation.

2. Mapping. Mapping of the vegetation of the study area into plant habitat types was undertaken with the aid of the Kogarah 1:1Ø,ØØØ orthophotomap and a large scale aerial photograph of the area.

3. Field Evaluation. Field inspection of the area was undertaken by Roger Lembit to ground truth the vegetation mapping. More detailed description of the vegetation was not considered necessary due to the disturbed nature of the area.

3.2 Fauna Surveys

There is considerable information available about the terrestrial fauna inhabiting the study area and the Botany Bay region. Surveys of fauna in the study area have been undertaken by the State Pollution Control Commission [Botany Bay studies] and several natural history groups. The information from these surveys is contained in numerous published and unpublished letters and reports which will be referred to where necessary.

In addition the author [M.Denny] has undertaken studies of the Mill Ponds and Rockdale Wetlands and Wolli Creek for plans of management and for environmental impact assessment. Information obtained from these studies was used in the present report.

To assist in the assessment of impacts from the development, it was necessary to divide the study area into four major habitat groups. These groups represented the main areas of usage by the avifauna in the Botany Bay region, and all would be subject to different types of impact from the construction of the third runway. The four habitat groups used were:

1. Open Waters. This habitat comprises the shallow and deep open waters of Botany Bay and part of the Pacific Ocean. The open waters habitat is further divided into

three sections: shallow waters near the shore, deeper waters of the Bay, and the open ocean near the Bay's entrance. There is a relatively large group of birds which move along the coast feeding within the deeper waters. This group of Oceanic Birds could be affected by aircraft during take-off and landing.

2. Shoreline. This habitat is restricted to that area of the northern foreshore of Botany Bay near Foreshore Road. The area consists of open beach and mud flat, sand dunes and shallow ponds, and was extensively modified during the construction of Foreshore Road and other developments.

3. Mill Ponds. This habitat comprises the lower section of the Mill Stream i.e. Mill Pond and Engine Pond, and where the water course enters Botany Bay. The ponds [originally part of the Mill Stream and Lachlan Swamps] within East Lakes and The Lakes Golf Course are also included in this habitat. The water within this habitat is fresh.

4. Airport. The airport is an important habitat, in terms of the impact from the development, and supports a range of introduced and native animal species, particularly birds. Fauna usage of Sydney Airport has been recorded during studies of the incidence of bird strike.

4.Ø RESULTS

4.1 Vegetation

4.1.2 Vegetation Communities

Six plant communities/habitat types were mapped within the study area [see Figure 1]. These were:

Map Unit 1. Shrubland of Sydney Golden Wattle and Coastal Tea Tree [Acacia longifolia - Leptospermum laevigatum]

This was located on dune areas along Foreshore Drive and within the grounds of Sydney Airport. The Foreshore Drive area includes regenerating vegetation and has a relatively low species diversity.

Map Unit 2. Grassland of Coastal Spinifex [Spinifex hirsutus]

This community is located in a regeneration area adjacent to the existing runway and in areas along Foreshore Drive. There is low species diversity in this community.

Map Unit 3. Saltmarsh with Samphire [Sarcocornia quinqueflora] as the dominant species.

Located at the outlet from Botany Swamps, behind the MSB Hydraulics Laboratory and towards the tunnel on General Holmes Drive. There is a good diversity of saltmarsh species with some invading mangroves, predominantly Grey Mangrove [Avicenna marina] with occasional River Mangrove [Aegiceras corniculatum]. The Saltmarsh area behind the M.S.B. Hydraulics Laboratory is of interest as it has a high proportion of Mimulus repens, possibly due to the brackish water. The Saltmarsh area towards the tunnel is significant because it is one of only two saltmarshes in the Sydney Region which supports Carex pumila and it is dominated by Bulboschoerus sp. [P.Adam, pers. comm.].

Map Unit 4. Reedland of Common Reed [Phragmites australis].

This community is located near the Saltmarsh on General Holmes Drive and in the Airport grounds north of the Drive.

Map Unit 5. Freshwater Bodies.

The freshwater bodies are associated with Mill Stream, particularly the Engine Pond. The community supports a variety of native and exotic waterplants such as Baumea spp., Schoenus masachalinus and Nymphaea mexicana.

Map Unit 6. Cleared Land.

The Cleared Land map unit includes grassland dominated by exotics, areas supporting exotic shrubs and trees, as well as developed areas. Also included in this unit are those areas adjacent to General Holmes Drive planted with native species.

4.1.2 Significance of the Vegetation

The Saltmarsh areas near the M.S.B. Hydraulics Laboratory are of some scientific interest because:

a. They provide a contribution to the study of succession in intertidal wetlands, and

b. The saltmarsh in the Sydney Region is confined to relatively small areas of suitable habitat.

The saltmarsh communities are of recent creation having developed as a result of the reshaping of the northern foreshore of Botany Bay in the late 1970's [Mitchell and Adam, 1989].

The Reedland and Freshwater Bodies vegetation are also of significance as they are of vegetation types of very limited extent in the Sydney Region.

The regeneration areas along Foreshore Drive have significance as a wildlife habitat and for recreation.

4.2 Fauna

4.2.1 Faunal Assemblages

Because of the disturbed nature of the land in the study area, there are few records of and a low potential for the presence of small native ground vertebrates i.e. mammals, reptiles. The dominant fauna in the area are birds, both native and introduced. This is due to the presence of large expanses of fresh and sea water and the Botany Bay shoreline.

1. MAMMALS

There are few records of either native or introduced mammals in the study area, and these, together with species expected to occur, are listed in Appendix 1 of this report. Sight inspection has revealed the presence of introduced cats and dogs, some of which could be classed as feral. Rabbits are found in many of the grassed areas, particularly associated with the golf courses, and horses are exercised along the shores of Botany Bay.

According to the records of The Australian Museum and an environmental study of Botany Bay [Minister for Environment Control, 1975] there are several small native mammals expected in the study area. These are the Common Ringtail and Brushtail Possum, Long-nosed Bandicoot and the Water Rat. All are common occupants of the urban environment of Sydney [Marlow, 1972], together with smaller introduced rodents such as the Black Rat, Brown Rat and House Mouse.

Of importance to the construction of a third runway is the presence of a number of bat species in the study area [potential for collisions with airplanes]. Although not surveyed, bats were observed by van Tets et al [1969] feeding around the runway lights at Sydney Airport. The study by van Tets does not list any species, but the Australian Museum records at least nine species of bat in the Sydney Region, some of which have been recorded in the Botany area. Bats known from southern Sydney and expected to occur in the study area include the Grey-headed Flying-fox, Eastern Horseshoe-bat, Yellow-bellied Sheathtail-bat, Eastern Little Mastiff-bat, Gould's Long-eared Bat, Lesser Long-eared Bat, Common Bent-winged Bat, Gould's Wattled Bat and Little Cave Eptesicus. Details of their size, behaviour and roosting habits are provided in Table 1.

TABLE 1: CHARACTERISTICS OF BAT FAUNA LIKELY TO BE PRESENT AT SYDNEY AIRPORT

Data from The Australian Museum, Strahan [1983], Hall and Richards [1979] and Parry-Jones [1987].

1. Grey-headed Flying-fox.

Size: Weight 600 - 1000g, Length 250mm
Roost: Branches of large trees, including mangroves. Roosting area in Sydney appears to be at Gordon, which is occupied all year round.
Comments: The most common flying-fox on the more urbanised coast of Australia, known to be in numbers up to 46,000, and capable of flying relatively long distances to feed on fruit and blossoms in the evening [>15km].

2. Eastern Horseshoe Bat.

Size: Weight 10g, Length 44mm
Roost: Warm and humid caves, tunnels or old mines. Colonies generally small [5 to 50].
Comments: Small insectivorous bat which hunts low to the ground and is a slow flyer. It is known to feed on aquatic insects found on the surface of the water.

3. Yellow-bellied Sheathtail-bat.

Size: Weight 30-60g, Length 83mm
Roost: In tree hollows, usually solitary but in colonies of less than 10.
Comments: Widespread in Australia, usually feeding above forest canopy, but can be found lower.

4. Eastern Little Mastiff-bat

Size: Weight 8g, Length 50mm
Roost: In small colonies in tree hollows or under loose bark. Hunts insects whilst flying swiftly above the forest canopy or in clearings.

5. Gould's Long-eared Bat

Size: Weight 9g, Length 58mm
Roost: Tree hollows, abandoned buildings, under loose bark etc. Fairly solitary and colonies number up to 25. Forages for flying insects in forests and open areas, as well as feeding on foliage insects.

TABLE 1: CHARACTERISTICS OF BAT FAUNA LIKELY TO BE PRESENT AT SYDNEY AIRPORT [Continued]

6. Lesser Long-eared Bat

Size: Weight 8g, Length 50mm
Roost: Variety of habitats e.g. bark of trees, roofs of buildings, canvas awnings, clothes.
Comments: probably the most wide-ranging bat in Australia and well adapted to urban environments. The bat has a "fluttery" flight and feeds low to, and lands on the ground in search of insects.

7. Common Bent-wing Bat

Size: Weight 20g, Length 58mm
Roost: Caves, old mines, stormwater channels and buildings. Found in high numbers [1,500 per square meter].
Comments: Prefers well-timbered valleys where it generally feeds above the tree canopy.

8. Gould's Wattled Bat

Size: Weight 14g, Length 70mm
Roost: Tree hollows, bird nests, ceilings or basements of buildings, canvas blinds etc. Usually up to 30 individuals in a colony.
Comments: Forages below the tree canopy, seldom flying more than 20m above the ground but descending as low as 1m. Food consists of beetles, caterpillars, crickets and moths.

9. Little Cave Eptesicus

Size: Weight 5g, Length 46mm
Roost: Caves, mines, rock crevices and buildings. Colonies range from 10 to 500 individuals.
Comments: Usually hunt for insects such as mosquitoes, flies and moths, between the level of the tree canopy and about two metres above the ground.

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2. HERPETOFAUNA

The changed nature of the land within most of the study area has lead to the situation where there are few reptile species known from Sydney Airport and the surrounding land. Common urban-dwelling lizards include the small fence and garden skinks [Leiolopisma spp.], Copper-tailed Skink, Three-toed Skink and the larger Blue-tongued Lizard and Bearded Dragon. In the Mill Ponds area, the Water Skink may also be found. Because of the proximity of the study area to residential development, the diversity and densities of ground dwelling reptiles would be low. Hunting by dogs and cats, as well as humans would maintain population numbers at a low level, and it is unlikely that the range of snakes found in the area would go beyond the Common Eastern Brown Snake and the Red-bellied Black Snake.

The prospects for amphibians in the study area is better. There is an abundance of freshwater swamps associated with the Mill Stream and Cooks River, and these would support a diversity of frogs. Frog species commonly encountered in the Sydney Region are the Green Tree Frog, Brown Tree Frog, Golden Bell Frog, Lesueur's Frog, Brown Froglet, Brown Frog and Eastern Banjo Frog. Other species would also be expected.

3. AVIFAUNA

A total of 138 species of bird are known from the study area. The diversity of species in the study area is similar to that recorded from Sydney Harbour National Park [152, Morris, 1986], Wolli Creek [154, Rankin, 1989] and Botany Bay National Park [190, Morris, 1989]. A list of avifauna species known to occur within the study area is provided in Appendix 3.

The major component of the assemblage of avifauna is that associated with sea and freshwater. Of the 138 species recorded from within the study area, 105 [76%] require an aquatic habitat for part of it's life. There are 30 species utilizing deep water for feeding [called Sea Birds]. Most of these are far-ranging over the southern oceans and can be classed as occasional visitors to Botany Bay, but some e.g. cormorants, are permanent residents.

There appears to be no concise definition of a "seabird" and this group of avifauna covers a wide range of bird types. Some species will move hundreds of kilometres over open ocean between nesting and feeding sites, while others are sedentary in their habits and some have lost the use of their wings e.g. penguins. The most useful characteristic of this group of birds is that all "are able to exploit salt water in depth, from the tidal and estuarine perimeter of tropical and polar lands, to the wide open ocean." [Hoskin and Lockley, 1983]. Many seabirds obtain their food at or just above the surface by skimming over the water. Other species obtain food by diving to varied depths. Of these

divers some "fly" under water with flippers or half-open wings, while others use their webbed feet to propel their streamlined bodies in pursuit of their selected prey.

More than half the seabird species feed upon fish. These are mainly the larger seabirds such as albatross, cormorants and petrels, which can feed on fish up to a limit of their swallowing capacity. The smaller seabirds e.g. penguins, storm-petrels, prions, depend upon the small zooplankton and other invertebrates such as shrimps, crab larvae, squid, jellyfish etc.

Species considered as seabirds belong to the orders Sphenisciformes [penguins], Procellariformes [albatrosses and other petrels], Pelecaniformes [tropic-birds, frigate-birds, gannets, cormorants and pelicans] and to the families Stercorariidae [skuas] and Laridae [gulls and terns].

There is a relatively large component of the avifauna which utilize the shallow waters, shorelines and mud flats found within Botany Bay, as well as the freshwater ponds at Botany. Approximately 80 bird species fit into this category and include a sizeable collection of migratory waders. Tables 2 and 3 outline some of the characteristics of the oceanic and wading birds known to occur in the study area.

The remaining 33 species are birds predominantly associated with dry land. The range of species in this category is relatively low, possibly because of the degraded nature of this part of the study area. There is a relationship between the density and diversity of bird species and the structure and productivity of plant communities in which they reside [Recher, 1985]. The lack of structural and floral diversity within the plant communities in the study area would lead to the low number of bird species found. The difference in the numbers of birds found in the study area and in the nearby National Parks is mainly due to the lower number of terrestrial species in the study area.

The range of terrestial avifauna located in the study area is typical of that found in areas of urban bushland. Several species of raptor are known from the area. These are wide-ranging species which utilize a variety of habitats for feeding within their large home range. Only one species of parrot [Galah] has been recorded from the area, but it is expected that the Eastern Rosella would be found, as this species is common within the Sydney Region. The diversity of foliage birds is low and includes many species commonly encountered within suburban gardens e.g. Kookaburra, Willie Wagtail, New Holland Honeyeater, thornbill, Superb Fairy-wren, Silvereye. The larger scavenging birds such as the Australian Raven and Pied Currawong are also common in the study area.

TABLE 2: CHARACTERISTICS OF SEA BIRDS KNOWN FROM THE STUDY AREA

Information from numerous sources, including Mount King Ecological Surveys [1989]. Australian status derived from MacDonald [1973] and breeding status from van Tets and Fullagar [1984].

1. Little Penguin [Eudyptula minor]

Australian Status: Common, Breeds in Australia.

Known Distribution in Botany Bay: Regular occurence in small numbers.

Period Spent in Australia: All year.

The Little Penguin is distributed throughout southern Australia and is known to breed within most of it's range. Though adults are absent at sea for weeks at a time when not breeding, they will return to the same breeding site year after year. However, the young disperse over a wide area, sometimes travelling great distances [over 1000 km recorded]. The Little Penguin feeds on small fish and squid. It is vulnerable to attacks by foxes, dogs etc and is sensitive to changes to habitat by humans. Breeding of the Little Penguin in Australia occurs between August and November, but it may be as late as March.

2. Wandering Albatross [Diomedea exulans]

Australian Status: Fairly Common, non-breeding visitor

Known Distribution in Botany Bay Area: Common winter migrant, in numbers less than 10.

Period Spent in Australia: Arrive autumn, Depart spring.

The Wandering Albatross breeds on islands in the sub-Antarctic zone and uses most of the Southern Ocean. It can travel 100-200 km a day and have been known to travel more than 10,000 km. The species is most frequent in Australian waters in winter and, in N.S.W., four times as many birds are seen offshore as inshore. The Wandering Albatross scavenges during the day but feeds mainly at night on squid and fish. Relatively large congregations [c.500 birds] have been observed in feeding areas e.g. sewerage outlets. Populations are adversely affected by fishing operations e.g. caught on long lines or shot by fishermen.

3. Black-browed Albatross [Diomedea melanophrys]

Australian Status: Common, non-breeding visitor.

Known Distribution in Botany Bay Area: Common winter migrant, in numbers 30-100.
Period Spent in Australia: All year, less in summer.

The Black-browed Albatross breeds on islands near New Zealand or in the sub-Antarctic zone. The species is commonly recorded on the eastern coast of Australia and reaches north of Sydney. It is regarded as the commonest albatross in the vicinity of Botany Bay National Park. Although the species is present throughout the year, it is least abundant during the summer months. Off N.S.W. the Black-browed Albatross is rarely seen when the surface water temperature was above 18 C. degrees and it may be an inhabitant of waters with surface temperatures between 9 and 18 C. degrees. The bird feeds upon squid and will follow boats to feed on offal.

4. Yellow-nosed Albatross [Diomedea chlororhynchos]

Australian Status: Common to abundant in southwest seas, non-breeding visitor.

Known Distribution in Botany Bay Area: Uncommon winter migrant, numbers about 30.

Period Spent in Australia: Arrive April-May, Depart October-November

The Yellow-nosed Albatross breeds on northern sub-Antarctic islands in the Indian and Atlantic Oceans and ranges along the southern Australian coast as far as the 30 degrees latitude. Recoveries of birds banded at the breeding grounds indicate a north-easterly movement of young away from the colonies in their first winter and the western coast of Australia supports higher numbers of this albatross than on the eastern coast. It is regarded as the least common albatross seen from Botany Heads. The presence of the Yellow-nosed Albatross in parts of Australia is strongly seasonal; in south-eastern Australia this albatross is mainly seen during winter. This species tends to inhabit inshore waters rather than open ocean and feeds on squid, fish and crustaceans.

5. Shy Albatross [Diomedea cauta]

Australian Status: Common, breeding in Australia.

Known Distribution in Botany Bay Area: Relatively common, seen offshore of Botany Heads.

Period Spent in Australia: Arrive November, Depart June.

The Shy Albatross is the only albatross to breed in Australian waters [Tasmania/Bass Strait islands]. This bird appears to move along the southern coast of Australia and shows a seasonal

pattern of movement. It moves south in late November, then re-appears in the Tasman Sea in large numbers in June. Numbers of the Shy Albatross in south-east Australia are higher in winter. The bird is usually inshore from the edge of the continental shelf where it feeds almost exclusively on mackerel and squid.

6. Southern Giant Petrel [Macronectes giganteus]

Australian Status: Moderately Common, non-breeding visitor.

Known Distribution in Botany Bay Area: Common winter migrant, numbers about 2Ø. Regularly observed offshore, mostly during August.

Occuring regularly in winter in the southern waters of Australia, the Southern Giant Petrel mainly feed on offal and will gather in groups to feed on stranded carcases. It is a fast glider in high winds and will pick up food from the surface of the sea.

7. Cape Petrel [Daption capense]

Australian Status: Common, non-breeding visitor

Known Distribution in Botany Bay Area: Uncommon winter visitor, numbers about 3Ø.
Period Spent in Australia: Arrive April-May, Depart September

The Cape Petrel breeds on the mainland and islands of Antarctica and on sub-Antarctic islands. During winter the Cape Petrel wanders further north than other petrels and it is most commonly seen along the southern Australian coast during this season. The Cape Petrel is often washed up on Australian beaches after storms and at sea, it is usually seen singly, in pairs or in flocks. Most Cape Petrels are seen well offshore. This species feeds on krill, squid, fish and crustacea. It is attracted to sewage outfalls and follows ships.

8. Fairy Prion [Pachyptila crassirostris]

Australian Status: Fairly common, Breeds in Australia.

Known Distribution in Botany Bay Area: Uncommon winter visitor, number about 15Ø.
Period Spent in Australia: All year [mostly summer].

The Fairy Prion breeds on islands in Bass Strait and round the Tasmanian coast and is recorded most frequently along the N.S.W. coast between June and August. The Fairy Prion feeds on crustacea, squid and marine plankton.

9. Wedge-tailed Shearwater [Puffinus pacificus]

Australian Status: Common, Breeds in Australia

Known Distribution in Botany Bay Area: Common summer migrant, numbers 100 to 900.

Period Spent in Australia: Arrive August, Depart May.

The Wedge-tailed Shearwater breeds on islands off the eastern and western coast of Australia. Some populations of Wedge-tailed Shearwater migrate. In N.S.W. the species is present only during the breeding season, August to May. It is the commonest shearwater off Botany Heads. The wintering grounds of this species is unknown. Food items are squid, crustacea and small fish. The Wedge-tailed Shearwater is listed on the "Agreement between the Government of Australia and the Government of Japan for the protection of Migratory Birds in danger of extinction and their environment" [henceforth called JAMBA].

10. Sooty Shearwater [Puffinus griseus]

Australian Status: Common, Breeds in Australia.

Known Distribution in Botany Bay Area: Rare summer visitor, numbers about 10.

Period Spent in Australia: Arrive September, Depart April.

Although the Sooty Shearwater mainly breeds on islands round New Zealand and Cape Horn, there are nine islands in south-eastern Australia where this bird is known to breed. The Sooty Shearwater migrates from its breeding colonies during the winter season, where they travel northwards towards Japan. The Sooty Shearwater always breeds in colonies with Short-tailed and Wedge-tailed Shearwaters and feeds on small squid. The Sooty Shearwater is listed on JAMBA and on the "Agreement between the Government of the People's Republic of China and the Government of Australia for the Protection of Migratory Birds and their Environment" [henceforth called CHAMBA].

11. Short-tailed Shearwater [Puffinus tenuirostris]

Australian Status: Abundant, Breeds in Australia

Period Spent in Australia: Arrive September, Depart April

Known Distribution in Botany Bay Area: Abundant summer migrant, numbers up to 200.

Breeding of the Short-tailed Shearwater is restricted to the southern Australian coastline and islands. This species migrates from breeding colonies in April-May and arrives off Japan in May-June. The species' return to Australia is sometimes marked by spectacular wrecks on beaches i.e. many dead birds washed ashore, in the south-east regions, with the greatest mortality in December. Most birds feed on krill and small squid. Listed on

JAMBA.

12. Fluttering Shearwater [Puffinus gavia]

Australian Status: Fairly common, Non-breeding visitor.

Known Distribution in Botany Bay Area: Uncommon visitor, numbers up to 300.

Period Spent in Australia: All year [mostly winter].

The Fluttering Shearwater breeds on many islands in New Zealand and is found along the southern coast of Australia. Near Sydney the greatest numbers are found during October and near Bateman's Bay, during June to October. They are generally found close inshore and feed on crustacea and pelagic fish.

13. Flesh-footed Shearwater [Puffinus carpeipes]

Australian Status: Fairly common, Breeds in Australia.

Known Distribution in Botany Bay Area: Uncommon summer visitor, numbers up to 250.

Period Spent in Australia: Arrive August, Depart April/May

This species is known to breed at Lord Howe Island and on Western Australian islands. The species migrates as far north in winter as Japan and Korea and is most often seen in Australia in summer and autumn. This bird feeds on small fish, squid and crustaceans and will congregate around fishing boats for offal. Listed on JAMBA.

14. Australian Pelican [Pelecannus conspicillatus]

Australian Status: Common, Breeds in Australia.

Known Distribution in Botany Bay Area: Known from all sections of Botany Bay.

Period Spent in Australia: All year

The Australian Pelican is distributed throughout most of Australia but is known to be limited in the number of breeding colonies. ~~No breeding colonies are known from the coast of N.S.W., although they do breed inland in this state.~~ The Pelican can move great distances in search of food and will congregate in an area of abundant food. Although aquatic when feeding [on fish and crustacea] the Australian Pelican nests and roosts on land, sometimes in trees on coastal margins.

A breeding colony is known from the coast of NSW at Five Islands near Wollongong, other known breeding colonies are inland in the ACT

15. Australasian Gannet [Morus serrator]

Australian Status: Common, Breeds in Australia.

Known Distribution in Botany Bay Area: Common visitor, but mainly offshore, numbers in the Bay about 10 to 20.

Period Spent in Australia: All year, breeds October-May.

The Australasian Gannet breeds on islands in the Bass Strait and southern Tasmania and the young disperse widely from their colonies. The Australian Gannet appears to move along the N.S.W. coast with peak numbers noted between March and September. The Gannet feeds in deep water, either diving singly on to fish or herding shoals as a flock.

16. Great Cormorant [Phalacrocorax carbo]

Australian Status: Common, Breeds in Australia.

Known Distribution in Botany Bay Area: Common resident.

Period Spent in Australia: All year.

The Great Cormorant lives and breeds throughout Australia and is known to move long distances [mostly dispersal of young]. It breeds colonially in lakes and estuaries. This bird usually keeps to water several metres deep, both fresh and salt, where it feeds on slow moving fish. The Great Cormorant nests and roosts in trees, both solitary and in large flocks.

17. Pied Cormorant [Phalacrocorax varius]

Australian Status: Common, Breeds in Australia.

Known Distribution in Botany Bay Area: Moderately common resident.

Period Spent in Australia: All year.

The Pied Cormorant is restricted to Australia and New Zealand where it breeds both along the coast and inland. This species tends to disperse less than other cormorants but individuals are known to move relatively long distances. There is no evidence for seasonal movement. The Pied Cormorant inhabits fresh and salt water and it mainly eats fish, crustaceans and molluscs. Breeding is colonial and nesting and roosting takes place in trees. Its flight is direct and strong and low over the water, but they can fly in formation like geese.

18. Little Black Cormorant [Phalacrocorax sulcirostris]

Australian Status: Common, Breeds in Australia.

Known Distribution in Botany Bay Area: Uncommon visitor.

Period Spent in Australia: All year.

Known from most of Australia where it breeds both inland and along the coast. About 31% of banded Little Black Cormorants are known to disperse from their breeding sites. This bird is considered to be both solitary and nomadic and in some areas large numbers are found for short periods of time. It nests and roosts on trees near water. The Little Black Cormorant inhabits fresh and salt water and in mainland Australia is more often inland than on the estuaries. This species often fish socially, with groups of birds herding a school of fish. Insects and crustacea are also food items. Groups fly on formation like geese.

19. Little Pied Cormorant [Phalacrocorax melanoleucos]

Australian Status: Common, Breeds in Australia.

Known Distribution in Botany Bay Area: Common resident.

Period Spent in Australia: All year

The Little Pied Cormorant lives and breeds over most of Australia and about 20% of banded birds leave their breeding district. The species is considered sedentary and nomadic and is capable of moving long distances. The Little Pied Cormorant is mainly found in fresh water but also lives on estuaries and coasts. Single birds will fish in almost any pool a metre or more deep and on larger water bodies flocks of hundreds will form to feed, mainly on crustaceans. Nesting and roosting in trees near water.

20. Arctic Jaeger [Sterocorius parasiticus]

Australian Status: Fairly common, Non-breeding visitor from Northern Hemisphere.

Known Distribution in Botany Bay Area: Uncommon summer migrant.

Period Spent in Australia: Arrive September, Depart April

The Arctic Jaeger is a summer visitor to Australia, arriving in southern waters in October-November. Its arrival coincides with the rise in water temperature and strongest flow of the East Australian Current. This species leaves Australia in late April. In Australia, the Arctic Jaeger is a bird of harbours and bays where it tends to hunt singly. It feeds on the wing, robbing food from terns, gulls etc and also takes offal from boats. The Arctic Jaeger is listed on JAMBA.

21. Pomarine Jaeger [Stercorarius pomarinus]

Australian Status: Fairly common, Non-breeding visitor from Northern Hemisphere.
Known Distribution in Botany Bay Area: Uncommon summer migrant, numbers up to 200.

Period Spent in Australia: Arrive August, Depart November

The Pomarine Jaeger is a summer visitor to Australia where it is most abundant off the south-eastern coast. This Jaeger appears to move south as the warm surface water flows south in summer. It is bird of the inshore and offshore waters where it feeds on offal from ships and will also rob gulls and terns. Listed on JAMBA and CHAMBA.

22. Silver Gull [Larus novaehollandiae]

Australian Status: Abundant, Breeds in Australia

Known Distribution in Botany Bay Area: Known from all sections of Botany Bay.

Period Spent in Australia: All year.

Found on coastal and inland waters, the Silver Gull is one of the most well-known birds in Australia. Breeds in colonies e.g. Five Islands, usually in two periods of the year; September-December and March-June. The Silver Gull is a scavenger and a predator of other nesting sea birds. Roosts on rocks, flat areas and grasslands.

23. Pacific Gull [Larus pacificus]

Australian Status: Fairly common, Breeds in Australia.

Known Distribution in Botany Bay Area: Rare vagrant.

Period Spent in Australia: All year [breeds August-November].

Breeding along the southern and western coast of Australia between August to November, the young of the Pacific Gull disperse during early summer and in winter. The Pacific Gull lives on ocean beaches and offshore islands and mainly feeds on fish, marine invertebrates, carrion, shellfish etc.

24. Kelp Gull [Larus dominicanus]

Australian Status: Rare, Breeds in Australia.

Known Distribution in Botany Bay Area: Uncommon visitor.

Period Spent in Australia: All year.

The Kelp Gull is nowhere common in Australia where it breeds on coasts of N.S.W. and Tasmania. It is usually sedentary but is known to move large distances. Like other scavenging gulls it

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eats fish, marine invertebrates and carrion.

25. Whiskered Tern [Chlidonias hybrida]

Australian Status: Fairly common, Breeds in Australia.

Known Distribution in Botany Bay Area: Rare vagrant, recorded at Mill Ponds.

Period Spent in Australia: All year [mostly spring and summer].

The Whiskered Tern breeds in inland and coastal Australia and is widespread throughout the mainland. Part of the population appears to migrate north from Australia during summer. This species inhabits fresh or salt water swamps and lagoons and feed on insects, small fish and crustaceans.

26. Caspian Tern [Hydroprogne caspia]

Australian Status: Fairly common, Breeds in Australia.

Known Distribution in Botany Bay Area: Rare, occasional visitor, recorded from Mill Ponds.

Period Spent in Australia: All year.

The Caspian Tern lives and breeds throughout inland and coastal Australia. It is considered mainly sedentary with some local movement, but is known to undertake some longer distance seasonal movement. This bird breeds colonially between September and December in nests on the ground. The Caspian Tern lives on the seashore and round some inland waters and feeds off fish up to 18cm in length, which it catches by diving. Listed on JAMBA and CHAMBA.

27. Common Tern [Sterna hirundo]

Australian Status: Rare, Non-breeding visitor.

Known Distribution in Botany Bay Area: Common summer migrant, normally flocks between 50 and 100, up to 1000. Recorded from Mill Ponds.

Period Spent in Australia: Arrive October, Depart March/April.

The Common Tern breeds in North America, Europe, temperate Asia and Africa and is a regular summer visitor to Australia, although some have been known to remain throughout the winter. This bird lives on shallow estuaries with sand banks as well as tidal flats, harbours and beaches. It is usually seen in small groups and feeds mainly on fish. Listed on JAMBA and CHAMBA.

28. Little Tern [Sterna albifrons]

Australian Status: Common, Breeding in Australia.

Known Distribution in Botany Bay Area: Uncommon summer migrant, known from Mill Ponds.

Period Spent in Australia: Arrive September, Depart June.

The Little Tern has a world-wide distribution and breeds along the northern and eastern coasts of Australia. In south-eastern Australia Little and Fairy Terns overlap in range and sometimes breed in mixed colonies. This species is considered to be sedentary with dispersal, nomadic and migratory movements. It has been postulated that there is a northward movement along the N.S.W. coast towards the end of summer and a return movement in spring. In southern Australia the Little Tern is most abundant in summer. This species feeds mainly on fish taken in a dive from above the surface of the water and is often seen as large flocks. Encroaching vegetation, human activity and predation have led to a decline in the breeding populations of Little Tern in N.S.W. This species listed on Schedule 12 of the National Parks and Wildlife Act, 1974, and on JAMBA and CHAMBA.

29. Crested Tern [Sterna bergii]

Australian Status: Common, Breeds in Australia.

Known Distribution in Botany Bay Area: Common resident. Known from all sections of Botany Bay.

Period Spent in Australia: All year [breeds spring/summer].

The Crested Tern lives and breeds along all parts of the Australian coast. Breeding takes place in eastern and southern eastern Australia only in spring and summer. Young and adult Crested Terns disperse north and south from colonies in N.S.W. [185Økm recorded]. This bird is usually seen on any coast and even far out to sea. It fishes by plunge-diving and the prey is gripped just behind the head. Listed on JAMBA.

3Ø. Gull-billed Tern [Gelochelidon nilotica]

Australian Status: Moderately Common, Breeds in Australia.

Known Distribution in Botany Bay Area: Rare visitor, known from Mill Ponds.

Period Spent in Australia: All year.

Found in coastal and inland waters. Feeds by hawking over water and descending in shallow glides to seize food. Sedentary and nomadic.

31. White-winged Tern [Chlidonias leucoptera]

Australian Status: Moderately Common, Non-breeding visitor.

Known Distribution in Botany Bay Area: Rare visitor, known from Mill Ponds.

Period Spent in Australia: September to March.

Although visiting Australia in their thousands, Botany Bay is well out of range, and would only be recorded here as stragglers.

TABLE 3: CHARACTERISTICS OF WADING BIRDS KNOWN FROM THE STUDY AREA

1. Pied Oystercatcher [Haematopus ostralegus]

Australian Status: Fairly common, Breeds in Australia, Non-migratory

Known Distribution in Botany Bay Area: Not very common.

Period Spent in Australia: All year.

The Pied Oystercatcher has an almost continuous distribution around the coast of Australia as a subspecies, H. ostralegus longirostris, where it prefers the extensive intertidal mudflats of large marine embayments and sandy ocean beaches. It forages at low tide on intertidal mudflats and feeds on marine worms, cockles and mussels. Breeds throughout coastal Australia and is considered sedentary and nomadic. Listed as an endangered species in N.S.W. on Schedule 12 of the National Parks and Wildlife Act, 1974 [henceforth called Schedule 12].

2. Sooty Oystercatcher [Haematopus fuliginosus]

Australian Status: Uncommon, Breeds in Australia, Non-migratory.

Known Distribution in Botany Bay Area: Uncommon resident.

Period Spent in Australia: All year.

The Sooty Oystercatcher has a very patchy distribution around the Australian coastline where it is found on rocky intertidal shorelines and sandy beaches with nearby mudflats. They almost always breed on islands between September and January. No long distance movements have been recorded abd they probably move locally, in response to food availability. The Sooty Oystercatcher feeds among rocks or walks along the backs of beaches probing under washed-up seaweed. They feed on common intertidal invertebrates and dead fish. Classed as endangered in N.S.W. [Schedule 12].

3. Masked Lapwing [Vanellus miles]

Australian Status: Common, Breeds in Australia, Non-migratory.

Known Distribution in Botany Bay Area: Known from all sections of Botany Bay.

Period Spent in Australia: All year.

The Masked Lapwing is mainly found in the eastern half of Australia where they occupy a variety of habitats including pasture, saltmarsh and intertidal mudflats. This species breeds in coastal and inland Australia between July and January and and is considered sedentary and nomadic. The Masked Lapwing feeds in a variety of habitats on adult and larval insects and

earthworms.

4. Banded Lapwing [Vanellus tricolor]

Australian Status: Moderately Common, Breeds in Australia.

Known Distribution in Botany Bay Area: Known from Airport, Mill Ponds and Cooks River.

Period Spent in Australia: All year.

Mainly found in dry grasslands, having an erratic flight and a movement on ground of a succession of short rapid runs and motionless standing. Nests in depression in ground between July and December.

5. Grey Plover [Pluvialis squatarola]

Australian Status: Common, Non-breeding visitor, Migratory.

Known Distribution in Botany Bay Area: Rare visitor.

Period Spent in Australia: Arrive August, Depart April.

The Grey Plover is the largest of the migratory plovers, breeding in USSR, Alaska and arctic Canada. In Australia the Grey Plover is more abundant on the western and southern coasts, where it is confined to large marine embayments. It occurs irregularly in small numbers on the east coast during October to about March. This species forages over intertidal mudflats at low tide where the birds spread well apart and detect food e.g. molluscs visually, by pecking it from the surface of mudflats. Listed on JAMBA and CHAMBA and Schedule 12.

6. Lesser Golden Plover [Pluvialis fulva]

Australian Status: Common, Non-breeding visitor, Migratory

Known Distribution in Botany Bay Area: Common summer migrant, up to 12Ø recorded.
Period Spent in Australia: Arrive August/September, Depart March/April

The Arctic and sub-arctic tundras are the favoured breeding areas for the Lesser Golden Plover which visits Australia between September and March. This species is found on rocky coasts, mud flats, estuaries and coastal marshes where it locates its prey by sight. Its diet consists of molluscs, insects and crustacea. The Lesser Golden Plover is considered more vulnerable than other shorebirds, as sites holding large numbers lie along the south-east coast of Australia, where the most people, industry and residential development occurs. Listed on JAMBA and CHAMBA and Schedule 12.

7. Red-kneed Dotterel [Erythrogonys cinctus]

Australian Status: Uncommon to fairly common, Breeds in Australia, Non-migratory.

Distribution in Botany Bay Area: Rare, known from Mill Ponds.

Period Spent in Australia: All year.

The Red-kneed Dotterel is found mainly on freshwater wetlands and is rare in saline areas. It is sedentary with seasonal movements and forages for insects in mud and sand.

8. Double-banded Plover [Charadrius bicinctus]

Australian Status: Common, Non-breeding visitor, Migratory

Known Distribution in Botany Bay Area: Uncommon winter migrant.

Period Spent in Australia: Arrive January/February, Depart June/July.

The Double-banded Plover breeds in New Zealand and migrates accross the Tasman Sea to south-eastern Australia for winter [April-September]. This species forages at low tide on mudflats, preferring areas near grazed pasture or open saltmarsh, which are used for roosting at high tide. Food items include insects, mainly beetles.

9. Red-capped Plover [Charadrius ruficapillus]

Australian Status: Uncommon to fairly common, Breeds in Australia, Non-migratory.

Known Distribution in Botany Bay Area: Uncommon resident, small numbers [2-1Ø].

Period Spent in Australia: All year.

The Red-capped Plover lives and breeds throughout coastal and inland Australia. Dispersal movements occur, but there is no large-scale pattern of seasonal movement. In coastal areas, it feeds on intertidal mudflats and roosts on nearby sandy beaches, spits or saltmarsh, and generally avoids rocky shores. It is a surface feeder, seldom walking in water, and locates its prey by sight. Food items include insects, molluscs and crustaceans.

1Ø. Black-fronted Plover [Charadrius melanotus]

Australian Status: Common, Breeds in Australia, Non-migratory.

Known Distribution in Botany Bay Area: Rare visitor, known from Mill Ponds.

Period Spent in Australia: All year.

The Black-fronted Plover is the most widespread of Australia's resident shorebirds, occuring on inland and coastal wetlands. This bird breeds between September and January and is considered sedentary and nomadic. This bird forages over wet and dry mud near water, pecking food such as insects, from the surface.

11. Ringed Plover [Charadrius hiaticula]

Australian Status: Rare

Known Distribution in Botany Bay Area: Rare visitor.

Period Spent in Australia: Insufficient information.

Insufficient information available about this accidental visitor.

12. Mongolian Plover [Charadrius mongolus]

Australian Status: Moderately Common, Non-breeding visitor

Distribution in Botany Bay Area: Uncommon summer migrant.

Period Spent in Australia: September to May.

A gregarious bird, found in small flocks [c.2Ø, up to 1ØØ] on rock platforms and mud flats. When disturbed the birds rise with short trilling notes and fly low to another feeding spot. Listed on JAMBA and CHAMBA and Schedule 12.

13. Large Sand Plover [Charadrius leschenaultii]

Australian Status: Moderately Common, Non-breeding visitor.

Distribution in Botany Bay Area: Rare summer visitor.

Period Spent in Australia: October to May.

Found on coastal beaches, mudflats and almost any kind of open ground near sea. Individual birds feed over a small area and if disturbed they fly off swiftly, low down, uttering loud trilling calls. Listed on JAMBA and CHAMBA and Schedule 12.

14. Black-winged Stilt [Himantopus himantopus]

Australian Status: Fairly common, Breeds in Australia, Non-migratory.

Known Distribution in Botany Bay Area: Rare vagrant.

Period Spent in Australia: All year.

The Black-winged Stilt lives and breeds throughout Australia wherever wetland habitat occurs, mostly in areas of regular rainfall. It occurs on a variety of coastal and inland wetlands, generally only in small numbers on intertidal mudflats. This species is considered sedentary, but there is seasonal movement

in response to high rainfall [nomadic]. This stilt feeds on insects, brine shrimp and molluscs, by wading in shallow water and mud, and walking on drying mud and sand, pecking and jabbing at small prey items.

15. Ruddy Turnstone [Arenaria interpres]

Australian Status: Fairly common to rare, Non-breeding, Migratory.

Known Distribution in Botany Bay Area: Uncommon resident, flock numbers up to 11Ø.

Period Spent in Australia: Arrive September, Depart April

The Ruddy Turnstone is a summer visitor to Australia [September-April] from it's breeding areas in Siberia. It occurs on most of the Australian coast preferring shores where stones or stony pavements are exposed as well as sandier shores where seaweed has accumulated. It is generally absent from large embayments with extensive mudflats. The Ruddy Turnstone forages on sandy ocean beaches, rocky shores and intertidal mudflats feeding on molluscs and crustaceans. Listed in JAMBA and CHAMBA and Schedule 12.

16. Eastern Curlew [Numenius madagascariensis]

Australian Status: Uncommon to common, Non-breeding, Migratory.

Known Distribution in Botany Bay Area: Rare visitor.

Period Spent in Australia: Arrive August/September, Depart March/May

The Eastern Curlew breeds in eastern Siberia and northern China and visits Australia in summer [July-April]. It is most abundant at a small number of marine embayments on the eastern and south-eastern coasts of Australia where it occurs on intertidal mudflats, particularly those with extensive seagrass meadows. It is rarely seen feeding on near-coastal, non-tidal wetlands, although it occasionally roosts in them at high tide. Saltmarsh behind mangroves or sandy beaches and spits are its preferred roosting habitat. The Eastern Curlew forages at low tide on intertidal mudflats and roosts at high tide. It feeds on a variety of crustaceans. The Eastern Curlew is particularly sensitive to human disturbance when both feeding and roosting and is often the first species to take flight if disturbed. Listed in JAMBA and CHAMBA and Schedule 12.

17. Whimbrel [Numenius phaeopus]

Australian Status: Fairly common to scarce, Non-breeding visitor, Migratory.

Known Distribution in Botany Bay Area: Rare summer migrant.

Period Spent in Australia: Arrive July/Septemeber, Depart April/May

The Whimbrel breeds in eastern Siberia and migrates to Australia between July and April. It is mainly found in northern Australia, but also occurs along the eastern coast. It prefers tidal mudflats and mangrove-lined creeks where it forages at low tide. On rising tides it roosts either on sandy or rocky beaches, or in mangroves and trees on the coast. The Whimbrel forages mostly on intertidal mud, probing with its bill to obtain food such as crabs. Listed in JAMBA and CHAMBA and Schedule 12.

18. Grey-tailed Tattler [Tringa brevipes]

Australian Status: Fairly common to rare, Non-breeding visitor, Migratory.

Known Distribution in Botany Bay Area: Uncommon resident and summer migrant.

Period Spent in Australia: Arrive August/September, Depart April/May

The Grey-tailed Tattler breeds in Siberia and visits coastal Australia between September and April. Within Australia, this species may move up the eastern coast during March and April. The Grey-tailed Tattler occurs mostly in areas with extensive mangroves and intertidal mudflats. It often roosts at high tide on mangroves or other objects. If there are no mangroves, it roosts on sandy beaches with rocky areas. This species forages mostly over intertidal mudflats, feeding on crabs etc. Listed in JAMBA and CHAMBA and Schedule 12.

19. Common Sandpiper [Tringa hypoleucos]

Australian Status: Fairly common to uncommon, Non-breeding visitor, Migratory.

Known Distribution in Botany Bay Area: Rare summer vagrant.

Period Spent in Australia: Arrive August, Depart March

The Common Sandpiper is a summer visitor [August-March] from its breeding colonies in northern Asia and Europe and is found along the coast and on inland wetlands. It inhabits rocky shores, mangroves and the tidal course of rivers as well as inland lakes, streams, pools and dams. At high tide it roosts almost exclusively on rocks or on the roots and branches of mangroves and other coastal trees. The Common Sandpiper feeds on aquatic invertebrates and insects by probing in shallow water. Listed in

JAMBA and CHAMBA and Schedule 12.

20. Greenshank [Tringa nebularia]

Australian Status: Fairly common, Non-breeding visitor, Migratory.

Known Distribution in Botany Bay Area: Rare vagrant.

Period Spent in Australia: Arrive August/September, Depart March/April

The Greenshank breeds over a large part of the taiga forest and northern steppe zones of the Palaearctic and visits both coastal and inland Australia mostly between September and April. Some Greenshanks have been known to stay in N.S.W. the whole year round. This species occupies the shores of lagoons, swamps and large rivers as well as intertidal mudflats and sandy coasts. The Greenshank roosts in pools and puddles in saltflats behind mangroves or on sandy beaches. They feed in shallow water, often running rapidly to peck at food items such as fish and aquatic invertebrates. Listed in JAMBA and CHAMBA and Schedule 12.

21. Marsh Sandpiper [Tringa stagnatilis]

Australian Status: Uncommon, Non-breeding visitor, Migratory.

Known Distribution in Botany Bay Area: Known from the northern shores of Botany Bay.
Period Spent in Australia: Arrive August/September, Depart March/May.

The Marsh Sandpiper breeds from Bulgaria to northern Mongolia and is a visitor to Australia during summer [September-March]. The extensive intertidal mudflats of northern Australia are the preferred habitat for the Marsh Sandpiper and in southern Australia, they prefer inland saline wetlands. This species feeds near the water's edge in the upper parts of estuaries while running through shallow water, pecking rapidly or probing in wet mud. Appears to feed on invertebrates, molluscs and crustaceans. Listed in JAMBA and CHAMBA and Schedule 12.

22. Terek Sandpiper [Tringa terek]

Australian Status: Uncommon, Non-breeding visitor.

Known Distribution in Botany Bay Area: Known from the northern shores of Botany Bay.

Period Spent in Australia: September to April.

Main habitat is the margins of coastal waters, where the Terek Sandpiper prefers muddy beaches near mangroves, rocky pools and reefs. They have a flicking flight with a bobbing anf teetering action. The birds probe for food in the mud and sometime catch insects in the air. Listed in JAMBA and CHAMBA and Schedule 12.

23. Black-tailed Godwit [Limosa limosa]

Australian Status: Fairly common to rare, Non-breeding visitor, Migratory.

Known Distribution in Botany Bay Area: Known from the northern shores of Botany Bay.

Period Spent in Australia: Arrive August/September, Depart March

The Black-tailed Godwit breeds in Mongolia and eastern Siberia and visits Australia between August and March, although some birds stay through winter. Most remain in northern Australia but some travel further south. On the coast the Black-tailed Godwit feeds at low tide on wide intertidal mudflat, mostly along the water's edge. It roosts at high tide on sandy beaches, mudbanks and on areas of saltmarsh behind mangroves. This species feeds by probing its bill into soft mud near the edge of the water. It appears to eat invertebrates and plant material. Listed in JAMBA and CHAMBA and Schedule 12.

24. Bar-tailed Godwit [Limosa lapponica]

Australian Status: Fairly common, Non-breeding visitor, Migratory.

Known Distribution in Botany Bay Area: Large numbers in Botany Bay.

Period Spent in Australia: Arrive September, Depart March.

The Bar-tailed Godwit breeds in northern Siberia and western Alaska and visits the Australian coast between September and March [although some birds remain during winter]. This godwit forages on extensive intertidal flats, including those with seagrass meadows. It roosts at high tide on sandy beaches and spits. This bird feeds by repeatedly probing its bill into soft mud and sand near the edge of the water feeding on polychaetes and crabs. Listed in JAMBA and CHAMBA and Schedule 12.

25. Red Knot [Calidris canutus]

Australian Status: Rare to uncommon, Non-breeding visitor, Migratory.

Known Distribution in Botany Bay Area: Uncommon summer migrant.

Period Spent in Australia: Arrive August/September, Depart March/April

The Red Knot breeds in the holarctic and visits Australia in the summer [August-April]. Some birds stay over winter. The Red Knot feeds on intertidal mudflats in large flocks and it roosts on sandy beaches. This bird feeds by rapidly drilling soft sand and mud at the edge of the water-it is a tactile rather than a visual feeder. The main food items are molluscs and amphipods. Listed in JAMBA and CHAMBA and Schedule 12.

26. Great Knot [Calidris tenuirostris]

Australian Status: Rare to uncommon, Non-breeding visitor.

Known Distribution in Botany Bay Area: Uncommon summer migrant.

Period Spent in Australia: August to April.

The Great Knot breeds in northern Asia and feed in tidal flats and rock platforms in south-eastern Australia. Little is known about these birds, except that they are similar in behaviour to the Red Knot. Listed in JAMBA and CHAMBA and Schedule 12.

27. Sharp-tailed Sandpiper [Calidris acuminata]

Australian Status: Common, Non-breeding visitor.

Known Distribution in Botany Bay Area: Known from the northern shores of Botany Bay.

Period Spent in Australia: Arrive August, Depart March/April

The Sharp-tailed Sandpiper migrates from its breeding grounds in arctic Siberia to visit inland and coastal Australia in summer [August-April]. It occupies fresh water more than salt water habitats and also frequents brackish waters and estuaries. The Sharp-tailed Sandpiper prefers non-tidal wetlands, especially freshly exposed mudflats in drying lakes and it ventures onto intertidal mudflats between December and March. This bird feeds in mud or shallow water in a variety of wetlands. It is known to eat aquatic and terrestrial insects, molluscs, polychaetes and grass seeds. Listed in JAMBA and CHAMBA and Schedule 12.

28. Pectoral Sandpiper [Calidris melanotos]

Australian Status: Uncommon, Non-breeding visitor.

Known Distribution in Botany Bay Area: Known from the northern shores of Botany Bay.

Period Spent in Australia: September to March.

The Pectoral Sandpiper prefers the muddy edges of swamps and streams on the coast and inland, and is seldom found on bay shores and the sea coast. When disturbed they fly off rapidly and alight some distance away, or freeze like snipe among short plants. Listed in JAMBA and Schedule 12.

29. Baird's Sandpiper [Calidris bairdii]

Australian Status: Very rare vagrant.

Known Distribution in Botany Bay Area: Known from the northern shores of Botany Bay.

Period spent in Australia: Not known.

Insufficient information available.

30. Western Sandpiper [Calidris mauri]

Australian Status: Rare vagrant.

Known Distribution in Botany Bay Area: Known from the northern shores of Botany Bay.

Period Spent in Australia: Not known.

Insufficient information available.

31. Red-necked Stint [Calidris ruficollis]

Australian Status: Common, Non-breeding visitor, Migratory.

Known Distribution in Botany Bay Area: Uncommon summer migrant.

Period Spent in Australia: Arrive August, Depart April

The Red-necked Stint breeds in far north-eastern Siberia and migrates to inland and coastal Australia each summer [August-April], although young birds may remain during winter. On the coast this stint occupies large marine embayments where they forage in flocks on intertidal mudflats and roost on sandy ocean beaches and spits. Foraging on the mudflats is undertaken by rapidly jabbing its bill into the mud in search of prey such as polychaetes, amphipods, molluscs and insects. It usually feeds for the entire period for which mudflats are exposed, and in cold or windy weather, it will feed on near-coastal wetlands over high tide. It feeds mostly on wet or drying mud above the edge of the water. Listed on JAMBA and CHAMBA and Schedule 12.

32. Curlew Sandpiper [Calidris ferruginea]

Australian Status: Common, Non-breeding visitor, Migratory.

Known Distribution in Botany Bay Area: Large flocks occur in Botany Bay.

Period Spent in Australia: Arrive August/September, Depart March/May

The Curlew Sandpiper breeds in arctic Siberia and visits inland and coastal Australia during summer [September-March], although some birds remain during winter. On the coast, this bird lives on intertidal mudflats, roosting on sandy spits and beaches. On the mudflats the Curlew Sandpiper feeds in belly-deep shallow water, probing the underlying mud to depths of 20-40 mm, and often completely submerging its head. Food items include polychaetes, molluscs, crustaceans and insects. Listed in JAMBA and CHAMBA and Schedule 12.

33. Sanderling [Calidris alba]

Australian Status: Uncommon to rare, Non-breeding visitor, Migratory.

Known Distribution in Botany Bay Area: Rare summer visitor.

Period Spent in Australia: Arrive September, Depart April/May

The Sanderling breeds in the Holarctic and visits coastal Australia in summer [September-March]. It is most often found on sandy ocean beaches, where it feeds in the wave-washed zone at low tide, following receeding waves pecking in the wet sand for prey such as insects and worms. At high tide it will roost on rocky reefs. Listed in JAMBA and CHAMBA and Schedule 12.

34. Broad-billed Sandpiper [Limicola falcinellus]

Australian Status: Uncommon, Non-breeding visitor, Migratory.

Known Distribution in Botany Bay Area: Rare summer visitor.

Period Spent in Australia: November to March.

These birds breed in Siberia and are considered rare along the eastern coast of Australia. They feed on small crustaceans, mollusca and worms on areas of mudflat. Listed in JAMBA and CHAMBA and Schedule 12.

35. Buff-breasted Sandpiper [Tryngites subruficollis]

Australian Status: Rare vagrant.

Known Distribution in Botany Bay Area: Known from the northern shores of Botany Bay.

Period Spent in Australia: Not known.

Insufficient information. Listed in JAMBA AND CHAMBA and Schedule 12.

36. Latham's Snipe [Gallinago hardwickii]

Australian Status: Uncommon, Non-breeding visitor. Migratory.

Known Distribution in Botany Bay Area: Uncommon summer migrant.

Period Spent in Australia: August to April.

These birds are usually found on the ground in thick growth near the edge of freshwater swamps and streams. They have a swift erratic flight, with a peculiar weaving movement. Listed in JAMBA and CHAMBA and Schedule 12.

4.2.1 Status of Fauna

There is considerable confusion about the designation of status rankings to faunal species. There are at least three forms of "status" used to describe a species, particularly a bird species. Behavioural Status is applied to various general behavioural characteristics of a species e.g. breeding condition, movement habitats [migratory, nomadic, resident etc]. Population Status is used to rank the abundance of a species and may be applied either over the entire range of a species or within a small area of the range i.e. local status. In a review of the use of status terminology Carruthers [1986] lists 46 different rankings used when describing the population status of birds and suggests that a set of defined rankings be adopted.

The Conservation Status of a species is a series of rankings based upon information derived from behavioural and population status. Thus a species can have a high conservation status because it has a low population status e.g. rare, or a high conservation status because it is classed as migratory to Australia [but may be common].

Some information on behavioural status is provided for bird species in Tables 2 and 3, and information about the population status of mammals and birds is provided in Appendices 1 and 2.

There are no native ground mammals within the study area which could be classed as having a low population status e.g. scarce, over their range. All species known to occur are classed as either common or abundant. Several small mammal species usually occuring within areas of urban bushland i.e. Brown Antechinus, Bush Rat, were absent from the area, and even if these species did occur they could not be considered of conservation importance.

Of the bat species expected in the study area, two are classed as scarce and/or rare - the Yellow-tailed Sheathtail-bat and the Eastern Little Mastiff-bat. However, the population status of both species is considered to be underestimated because of their small size and ability to fly fast and high above the canopy [Strahan, 1983]. The remainder of the bat species are classed as common or abundant.

There are many bird species found within the study area that are classed as having a low population status and/or a high conservation status. These species are all found within the groups of seabirds and waders and many are the subject of international treaties and are listed as endangered fauna by the N.S.W. National Parks and Wildlife Service. Information about these listings is provided in Tables 2 and 3, and the Australian and State population status of each species [where it is known] is given in Appendix 2.

Species considered as uncommon within their State range include the Hoary-headed Grebe, Wandering Albatross, Yellow-nosed Albatross, Southern Giant Petrel, Australasian Gannet, Little

Bittern, Australian Shoveler, Spotless Crake, Lesser Golden Plover, Mongolian Plover, Doube-banded Plover, Ruddy Turnstone, Eastern Curlew, Whimbrel, Grey-tailed Tattler, Greenshank, Bar-tailed Godwit, Red Knot, Pomerine Jaeger, Gull-billed Tern, Caspian Tern and Common Tern. Those classed as scarce or rare in N.S.W. include the Sooty Oystercatcher, Grey Plover, Oriental Plover, Common Sandpiper, Black-tailed Godwit, Broad-billed Sandpiper, Sanderling, Arctic Jaeger and Kelp Gull.

Species considered as uncommon over all their range i.e. low Australian population status, include Hoary-headed Grebe, Little Egret, Comb-crested Jacana, Sooty Oystercatcher, Red-kneed Dotterel, Eastern Curlew, Whimbrel, Common Sandpiper, Black-tailed Godwit, Red Knot, Broad-billed Sandpiper, Sanderling, Gull-billed Tern and Restless Flycatcher. Those considered rare or scarce include the Kelp Gull and the Common Tern.

Many of the species considered as having a low population status and therefore of conservation importance i.e. high conservation status, for N.S.W. are also in the same catgory for Australia. Some of these are only placed into this category because of their vagrant nature along the eastern coast - they are only known from very few records where the species has been blown or washed into shore. These species are mainly the seabirds which travel along the coast, flying at the edge of or beyond the Continental Shelf. Most of the remainder of the group of birds with low population status are migratory waders which only visit Australia for limited periods. Again the low population status of many of these birds is possibly due to the vagrant nature of the species.

However, it must be pointed out that the study area, which includes the open deep and shallow waters of Botany Bay, the shoreline and mudflats of the estuarine areas, and the freshwater swamps along the Mill Stream has one of the highest populations in the Sydney Region of bird species which are considered of conservation importance, and would rank highly with other such areas along the coast of N.S.W.

5.Ø SIGNIFICANCE OF THE STUDY AREA

Although most of the land where the Third Runway will be constructed comprises has been cleared and is of little conservation significance, there are several areas which are considered of some ecological value. In Section 4.1.2, it is pointed out that the saltmarsh areas near the M.S.B. Hydraulics Laboratory are of some scientific importance and that the freshwater wetland areas have significance because of the limited distribution of their vegetation types in the Sydney region. The importance of these habitats has also been highlighted in the recent report by McGuinness [1988] on the ecology of Botany Bay.

In a survey of wetlands of the Sydney Region [Nature Conservation Council, 1989] the saltmarsh area formed by the eastern

embankment of the existing airport runway [Wetland No. 238] is coded as having a conservation capability of 5 i.e. limited clearing of the margins has occurred and there is only light weed invasion. The coding is from Ø to 7; Ø indicates that the area is non-functional as a wetland and 7 indicates that there has been no effective disturbance to wetland function. Thus Wetland No. 238 can be considered as having moderately high conservation capability. Wetland No. 239 [near M.S.B. Hydraulics Lab.] is also coded as 5, whilst Wetland No. 242 [Millstream] is coded as 3 i.e. extensive clearing has occurred, with about 3Ø to 6Ø% reclamation and heavy weed invasion.

Although the Millstream ponds [Engine and Mill Pond] are not classed as having high conservation capability, they are considered of importance as habitats for a variety of bird species [84, see Appendix 2] including several migratory species. The conservation importance of the Mill Ponds area has been discussed in the plan of management of this area and the following is taken from the report by Mount King Ecological Surveys [1988] on the flora and fauna:

"From a biological point of view, there is considerable conservation value in the Mill Ponds area. The area was once part of a chain of swamps that spread north from Botany Bay to Paddington and encompassed the swamps in Centennial Park. Other swamp systems were associated with the nearby Cooks River, but many have since been filled or drained and are now part of the urban development of Sydney. However, the remaining swamps [ponds] are of high importance as wetland areas supporting a variety of wildlife, particularly birds. Many of the swamps are used as resting and feeding areas for migrating birds travelling between different parts of the Sydney region e.g. to and from the Hawksbury-Nepean River system or between different areas within Australia. Some birds using these swamps have travelled between parts of Asia and Australia as part of a regular migratory route. The retention of the Mill Ponds [Lachlan Swamps] as part of the complex of wetlands in the Sydney region is an important aspect of the management of the area. The importance of the Mill Ponds area has been recognised by Goodrick [197Ø] in his survey of wetlands of coastal N.S.W. as a "Waterfowl habitat requiring preservation and rehabilitation".

Apart from the value of the Mill Ponds area as a wetland, the swamps contain several bird species that are considered of State and international importance. Schedule 12 of the National Parks and Wildlife Act [1974] for N.S.W. lists 15 bird species that are considered of conservation importance. These species are listed in Table 3. Of these species, 11 are also protected by the Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and their Environment [JAMBA]. These species are also listed in Table 4.

Another value of the Mill Ponds is that they are still a good example of coastal freshwater swamps that are easily accessible to people. Although they require considerable upgrading, they have a high value as an educational and passive recreational

resource in a region which has a limited natural environment.

TABLE 4: AVIFAUNA OF HIGH CONSERVATION IMPORTANCE

1. Fauna listed in Schedule 12 of the National Parks and Wildlife Act.

Fauna of Special Concern

Great Egret
Caspian Tern
Sharp-tailed Sandpiper
Lewin's Rail
Lesser Golden Plover
Greenshank
White-winged Tern
Common Tern
Red-necked Stint
Comb-crested Jacana
Latham's Snipe
Pectoral Sandpiper
Curlew Sandpiper

Vulnerable and Rare Fauna

Peregrine Falcon

Threatened Fauna

Little Tern

2. Fauna listed in JAMBA

Great Egret
Caspian Tern
Sharp-tailed Sandpiper
Latham's Snipe
Lesser Golden Plover
Greenshank
Common Tern
Red-necked Stint
Little Tern
Pectoral Sandpiper
Curlew Sandpiper

The shoreline area between the existing airport runway and Brotherson Dock contains one of the highest diversities of migratory waders in the Sydney Region and has been recommended for inclusion in the Ramsar Convention [Waugh, 1984]. The Ramsar Convention is part of the Australian Government's Treaties Series [No. 48, 1975] and is called the "Convention on Wetlands of International Importance especially as Waterfowl Habitat." Governments which become Contracting parties to the treaty are obliged to designate at least one wetland in their territory for the Ramsar "List of wetlands of international importance", and to make wide use of wetlands. At present there are 29 areas within Australia recommended for the list, including Towra Point, but not the northern foreshores of Botany Bay. However, the foreshore area has a greater diversity and density of wading birds than that found at Towra Point [Waugh, 1984].

There are at least 30 species of wader using the foreshore area near the airport [see Table 3], as well as several seabirds that

are considered of conservation significance. Most of the waders are listed on the two international treaties on migratory waders between Australia and Japan [JAMBA] and Australia and China [CHAMBA]. The Little Tern, a species considered as endangered in N.S.W. [listed on Schedule 12 of the N.S.W. National Parks and Wildlife Act, 1974], is known to breed within the foreshore area. Larkins [1984] describes the Little Tern breeding site [site G] as consisting of dredged sand, with some cover of Marram Grass. In addition, Red-capped Plovers are known to nest within the same site.

There can be little dispute about the importance of the Botany Bay estuary as a habitat for a wide variety of avifauna, particularly seabirds and migratory waders. In the report on "Water and Wading Birds of the Botany Bay Estuary" [S.P.C.C., 1979] it is stated that:

"As the Botany Bay system, is the largest remaining and best preserved complex, it is very valuable for maintenance of saltwater dependent birds in the Sydney region." and

"Because of its extensive saline wetlands and tidal flats, Botany Bay is an important transit area for Northern Hemisphere migratory waders."

As a summary of the significance of the study area it is concluded that the following areas are of high conservation importance:

1. The deep and shallow open waters of Botany Bay in general.

2. The area of foreshore land between the existing airport runway and Brotherson Dock, particularly at the western end, where the Little Tern nests.

3. The saltmarsh area near the M.S.B. Hydraulics Laboratory, and near the tunnel at General Holmes Drive.

The following areas are considered of moderate conservation importance:

1. Engine Pond.

2. Mill Pond.

The remaining areas can be considered as having low conservation value.

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APPENDIX 1: MAMMAL SPECIES KNOWN OR EXPECTED IN STUDY AREA

Bat fauna given in Table 1.

Scientific Name	Common Name	Status
MARSUPIALIA		
PERAMELIDIAE		
Perameles nasuta	Long-nosed Bandicoot	C
PETAURIDAE		
Pseudocheirus peregrinus	Common Ringtail Possum	C
PHALANGERIDAE		
Trichosaurus vulpecula	Common Brushtail Possum	A
EUTHERIA		
MURIDAE		
Hydromys chrysogaster	Water-rat	U
Rattus rattus	Black Rat	A
Mus musculus	House Mouse	A
LEPORIDAE		
Oryctolagus cuniculus	Rabbit	A
CANIDAE		
Canis familiaris	Feral Dog	C
Vulpes vulpes	Fox	A
FELIDAE		
Felis catus	Feral Cat	A
EQUIDAE		
Equus caballus	Horse	C

NOTES FOR TABLE 3:

1. Common and Scientific names and Australian population status fro Strahan (1983).

APPENDIX 2: AVIFAUNA KNOWN FROM THE SYDNEY AIRPORT AREA

Common Name	Scientific Name	Status		Areas					
		A	N	O			S	M	A	C
				1	2	3				
PODICIPEDIDAE										
Hoary-headed Grebe	Poliocephalus poliocephalus	U	U			X		X		X
Australasian Grebe	Tachybaptus novaehollandiae	C	A					X		X
SPHENISCIDAE										
Little Penguin	Eudyptula minor	C	MC		X					
DIOMEDEIDAE										
Wandering Albatross	Diomedea exulans	MC	U	X						
Black-browed Albatross	Diomedea melanophrys	C	MC	X						
Yellow-nosed Albatross	Diomedea chlororhynchos	C	U	X						
Southern Giant-Petrel	Macronectes giganteus	MC	U	X						
Cape Petrel	Daption capense	C	MC	X						
Prion	Pachyptila spp.			X						
Flesh-footed Shearwater	Puffinus carneipes	MC	MC	X						
Wedge-tailed Shearwater	Puffinus pacificus	C	C	X						
Sooty Shearwater	Puffinus griseus	C	MC	X						
Short-tailed Shearwater	Puffinus tenuirostris	A	A	X						
Fluttering Shearwater	Puffinus gavia	MC	MC	X						
PELECANIDAE										
Australian Pelican	Pelecanus conspicillatus	C	C			X		X		X
SULIDAE										
Australasian Gannet	Morus serrator	C	U	X						
ANHINGIDAE										
Darter	Anhinga melanogaster	MC	MC					X		
PHALACROCORACIDAE										
Great Cormorant	Phalacrocorax carbo	C	C		X			X		X
Pied Cormorant	Phalocrocorax varius	C	MC		X			X		
Little Black Cormorant	Phalacrocorax sulcirostris	C	A			X		X		X
Little Pied Cormorant	Phalacrocorax melanoleucos	C	A			X		X		
ARDEIDAE										
Pacific Heron	Ardea pacifica	C	C					X		
White-faced Heron	Ardea novaehollandiae	C	A					X		X
Great Egret	Egretta alba	C	C					X		X
Little Egret	Egretta garzetta	U	MC					X		
Intermediate Egret	Egretta intermedia	MC	MC					X		
Rufous Night Heron	Nycticorax caledonicus	MC	MC					X	X	
Little Bittern	Ixobrychus minutus	MC	U					X		
Australasian Bittern	Botaurus poiciloptilus	MC	MC					X		X
PLATALEIDAE										
Sacred Ibis	Threskiornis aethiopica	C	A					X		X
Straw-necked Ibis	Threskiornis spinicollis	A	A					X	X	
Royal Spoonbill	Platalea regia	MC	MC						X	
Yellow-billed Spoonbill	Platalea flavipes	MC	MC					X		

Common Name	Scientific Name	Status A	Status N	Areas O 1	Areas O 2	Areas O 3	Areas S	Areas M	Areas A	Areas C
ANATIDAE										
Black Swan	Cygnus atratus	A	C					X	X	X
Pacific Black Duck	Anas superciliosa	A	A					X		X
Grey Teal	Anas gibberifrons	A	A					X		X
Chestnut Teal	Anas castanea	C	MC					X	X	X
Australasian Shoveler	Anas rhynchotis	U	MC					X		
Hardhead	Aythya australis	C	C					X		
Maned Duck	Chenonetta jubata	C	A					X		
Musk Duck	Biziura lobata	MC	MC					X		
ACCIPITRIDAE										
Black-shouldered Kite	Elanus notatus	MC	C					X	X	X
Whistling Kite	Haliastus sphenurus	C	MC					X		X
Brown Goshawk	Accipiter fasciatus	MC	MC					X		X
Marsh Harrier	Circus aeruginosus	MC	MC					X		X
FALCONIDAE										
Australian Hobby	Falco longipennis	MC	MC					X		
Brown Falcon	Falco berigora	A	MC						X	
Australian Kestrel	Falco cenchroides	A	C					X	X	X
PHASIANIDAE										
Brown Quail	Coturnix australis	C	C					X		
RALLIDAE										
Baillon's Crake	Porzana pusilla	MC	MC					X		
Australian Crake	Porzana fluminea	MC	MC					X		
Spotless Crake	Porzana tabuensis	U	MC					X		
Dusky Moorhen	Gallinula tenebrosa	C	A			X		X		X
Purple Swamphen	Porphyrio porphyrio	MC	A					X	X	X
Eurasian Coot	Fulica atra	C	A					X		
JACANIDAE										
Comb-crested Jacana	Irediparra gallinacea	MC	U					X		
HAEMATOPODIDAE										
Pied Oystercatcher	Haematopus ostralegus	MC	MC				X			
Sooty Oystercatcher	Haematopus fuliginosus	U	S				X			
CHARADRIIDAE										
Masked Lapwing	Vanellus miles	A	C					X	X	X
Banded Lapwing	Vanellus tricolor	U	C					X	X	X
Grey Plover	Pluvialis squatarola	C	R				X			
Lesser Golden Plover	Pluvialis dominica	C	U				X	X		X
Red-kneed Dotterel	Erythrogonys cinctus	U	MC				X	X		
Ringed Plover	Charadrius hiaticula	R	-				X			
Mongolian Plover	Charadrius mongolus	MC	U				X			
Double-banded Plover	Charadrius bicinctus	C	U				X	X		X
Oriental Plover	Charadrius veredus	C	S				X			
Red-capped Plover	Charadrius ruficapillus	MC	C				X	X		
Black-fronted Plover	Charadrius melanops	C	C				X	X		
Large Sand Plover	Charadrius leschenaultii	MC	S				X			

Common Name	Scientific Name	Status A	Status N	Areas O 1	Areas O 2	Areas O 3	Areas S	Areas M	Areas A	Areas C
RECURVIROSTRIDAE										
Black-winged Stilt	Himantopus himantopus	MC	C				X	X		X
Red-necked Avocet	Recurvirostra novaehollandiae	MC	MC				X			
SCOLOPACIDAE										
Ruddy Turnstone	Arenaria interpres	MC	U				X			
Eastern Curlew	Numenius madagascariensis	U	U				X			
Whimbrel	Numenius phaeopuss	U	U				X			
Little Curlew	Numenius minutus	U	R				X			
SCOLOPACIDAE										
Grey-tailed Tattler	Tringa brevipes	MC	U				X			
Common Sandpiper	Tringa hypoleucus	U	S				X			
Greenshank	Tringa nebularia	MC	U				X	X		X
Marsh Sandpiper	Tringa stagnatilis	U	U				X			
Terek Sandpiper	Tringa terek	R	S				X			
Latham's Snipe	Gallinago hardwickii	MC	MC				X	X		
Black-tailed Godwit	Limosa limosa	U	S				X			
Bar-tailed Godwit	Limosa lapponica	MC	U				X			
Great Knot	Calidris acuminata	C	C				X			
Red Knot	Calidris canutus	U	U				X			
Sharp-tailed Sandpiper	Calidris acuminata	C	C					X	X	X
Pectoral Sandpiper	Calidris melanotos	R	S				X	X		
Baird's Sandpiper	Calidris bairdii	R	-				X			
Western Sandpiper	Calidris mauri	R	-				X			
Red-necked Stint	Calidris ruficollis	C	MC				X	X	X	X
Curlew Sandpiper	Calidris ferruginea	C	MC				X	X	X	X
Broad-billed Sandpiper	Limicola falcinellis	U	S				X			
Sanderling	Calidris alba	U	R				X			
Buff-breasted Sandpiper	Tryngites subruficollis	R	-				X			
Broad-billed Sandpiper	Limicola falcinellus	U	S				X			
STERCORARIIDAE										
Arctic Jaeger	Stercorarius parasiticus	MC	S		X					
Pomarine Jaeger	Stercorarius pomarinus	MC	U	X						
LARIDAE										
Silver Gull	Larus novaehollandiae	A	A					X	X	X
Pacific Gull	Larus pacificus	MC	R		X					
Kelp Gull	Larus dominicanus	R	R		X					
Whiskered Tern	Chlidonias hybrida	MC	MC					X		
White-winged Tern	Chlidonias leucoptera	MC	S		X			X		
Gull-billed Tern	Gelochelidon nilotica	U	U					X		
Caspian Tern	Hydroprogne caspia	MC	U		X			X		X
Common Tern	Sterna hirundo	R	U		X			X		
Little Tern	Sterna albifrons	C	MC		X			X		
Crested Tern	Sterna bergii	C	MC		X			X		
COLUMBIDAE										
Feral Pigeon	Columba livia	C	A						X	
CACATUIDAE										
Galah	Cacatua roseicapilla	A	A							

Common Name	Scientific Name	Status A	Status N	Areas O 1	Areas O 2	Areas O 3	Areas S	Areas M	Areas A	Areas C
CUCULIDAE										
Pallid Cuckoo	Cuculus pallidus	MC	C							X
Horsefield's Bronze Cuckoo	Chrysococcyx basalis	C	C					X		X
ALCEDINIDAE										
Azure Kingfisher	Ceyx azurea	MC	MC					X		
Laughing Kookaburra	Dacelo novaeguineae	A	A					X		X
Sacred Kingfisher	Halcyon sancta	C	A					X		
ALAUDIDAE										
Skylark	Alauda arvensis	-	MC						X	
HIRUNDINIDAE										
Welcome Swallow	Hirundo neoxena	C	A					X	X	X
Tree Martin	Cecropis nigricans	A	A					X		
Fairy Martin	Cecropis ariel	C	A					X		
MOTACILLIDAE										
Richard's Pipit	Anthus novaeseelandiae	A	A					X	X	X
MUSCICAPIDAE										
Restless Flycatcher	Myiagra inquieta	U	A					X		
Willie Wagtail	Rhipidura leucophrys	A	A					X		X
SYLVIIDAE										
Clamorous Reed-Warbler	Acrocephalus stentoreus	C	A					X		X
Little Grassbird	Megalurus gramineus	MC	A					X		X
Golden-headed Cisticola	Cisticola exilis	C	A					X		X
MALURIDAE										
Superb Fairy-Wren	Malurus cyaneus	MC	A					X		
ACANTHIZIDAE										
Yellow-rumped Thornbill	Acanthiza chrysorrhoa	A	A							
MELIPHAGIDAE										
New Holland Honeyeater	Phylidonyris novaehollandiae	C	A					X		
EPHTHIANURIDAE										
White-fronted Chat	Ephthianura albifrons	C	C					X	X	
ZOSTEROPIDAE										
Silvereye	Zosterops lateralis	A	A					X		X
FRINGILLIDAE										
European Goldfinch	Carduelis carduelis	C	A						X	
PASSERIDAE										
House Sparrow	Passer domesticus	A	A						X	
PLOCEIDAE										
Double-barred Finch	Poephila bichenovii	C	A							
Zebra Finch	Poephila guttata	A	A					X		

European Starling

Common Name	Scientific Name	Status A	Status N	Areas O 1	Areas O 2	Areas O 3	Areas S	Areas M	Areas A	Areas C
GRALLINIDAE										
Australian Magpie-Lark	Grallina cyanoleuca	C	A					X	X	X
CRACTICIDAE										
Australian Magpie	Gymnorhina tibicen	A	A					X		X
Pied Currawong	Strepera graculina	C	A					X		
CORVIDAE										
Australian Raven	Corvus coronoides	C	A					X		X

NOTES FOR APPENDIX 2:

1. Scientific and common names from "Recommended English Names for Australian Birds" (RAOU, 1978).

2. Australian status from MacDonald, 1973 and New South Wales status from Morris et al, 1981. Status rankings used are:

A - Abundant
C - Common
MC - Moderately common
U - Uncommon
S - Scarce
R - Rare

3. Areas are as follows:

O 1 - Seabirds usually found outside Botany Bay.

O 2 - The deeper, more oceanic waters of Botany Bay.

O 3 - Shallower, more estuarine waters of Botany Bay.

S - Shoreline of Botany Bay near Foreshore Drive.

M - Engine Pond and Mill Pond

A - Existing Airport area.

C - Where Cooks River enters Botany Bay.

Appendix C

FLORISTIC LIST FOR AREA OF PROPOSED THIRD RUNWAY

APPENDIX 3 FLORISTIC LIST FOR AREA OF PROPOSED THIRD RUNWAY

FERNS

CYATHEACEAE
Cyathea sp.

ANGIOSPERMS

Dicotyledons

AIZOACEAE
Carprobrotus glaucescens
Tetragonia tetragonioides

AMARANTHACEAE
* Amaranthus viridis

APIACEAE
* Foeniculum vulgare
* Hydrocotyle bonariensis

ASCLEPIADACEAE
* Araujia hortorum
* Gomphocarpus fruticosus

ASTERACEAE
* Bidens pilosa
* Chrysanthmoides monilifera
* Cirsium vulgare
* Conyza bonariensis
Cotula coronopifolia
* Helianthus annuus
* Hypochoeris radicata
* Lactuca serriola
* Senecio lautus
* Sonchus oleraceus
* Taraxacum officinale

AVICENNIACEAE
Avicennia marina

BAUERACEAE
Bauera rubioides

BRASSICACEAE
* Brassica fruticulosa

CACTACEAE
* Opuntia stricta

CASUARINACEAE
Allocasuarina littoralis
Casuarina glauca

* Solanum nigrum
* Nymphaea mexicana

CHENOPODIACEAE
* Atriplex nastata
* Chenopodium album
Sarcocornia quinqueflora
Suaeda australis

EPACRIDACEAE
Monotoca elliptica

EUPHORBIACEAE
* Ricinus communis

FABACEAE
Acacia elata
Acacia floribunda
Acacia longifolia
Acacia longifolia
* Acacia saligna
Glycine tabacina
* Lupinus luteus
* Medicago sativa

LOBELIACEAE
Lobelia alata

MALVACEAE
* Modiola caroliniana
* Sida rhombifolia

MYRSINACEAE
Aegiceras corniculatum

MYRTACEAE
Callistemon citrinus
Eucalyptus botryoides P
Kunzea ambigua
Leptospermum laevigatum
Melaleuca armillaris P
Melaleuca ericifolia

ONAGRACEAE
Ludwigia peploides
* Oenothera stricta

* Ludwigia peruviana

PAPAVERACEAE
* Argemone ochroleuca

PLANTAGINACEAE
* Plantago lanceolata

POLYGONACEAE
* Acetosa sagittata

Persicaria strigosa
Persicaria sp. A

PRIMULACEAE
Samolus repens

PROTEACEAE
Banksia integrifolia
Hakea sericea

SCROPHULARIACEAE
Mimulus repens

SOLANACEAE
* Cestrum parqui
* Solanum nigrum

URTICACEAE
* Parietaria judaica

VERBENACEAE
* Lantana camara
* Verbena bonariensis

Monocotyledons

ARECACEAE
* Phoenix canariensis

CYPERACEAE
Baumea articulata
Baumea juncea
Bolboschoenus ? fluviatilis
Carex pumila
Chorizandra flexuosa
Cyperus ?laevis
Eleocharis sphacelata
Gahnia sieberana
Schoenoplectus validus
Scirpus nodosus
* Scirpus prolifer

JUNCACEAE
Juncus ? continuus
Juncus kraussii
Juncus planifolius
Juncus usitatus

JUNCAGINACEAE
Triglochin striata

LOMANDRACEAE
Lomandra longifolia

PHILYDRACEAE
Philydrum lanuginosum

POACEAE
* Avena fatua
* Bromus unioloides
* Chloris gayana
* Cortadiera selloana
Cynodon dactylon
* Digitaria sp.
* Eleusine indica
* Eragrostis curvula
Hemarthria uncinata
* Holcus lanatus
Imperata cylindrica
Isachne globosa
* Paspalum dilatatum
* Pennisetum clandestinum
Phragmites australis
* Rhynchelytrum repens
Spinifex hirsutus
* Sporobolus africanus
* Stenotaphrum secundatum

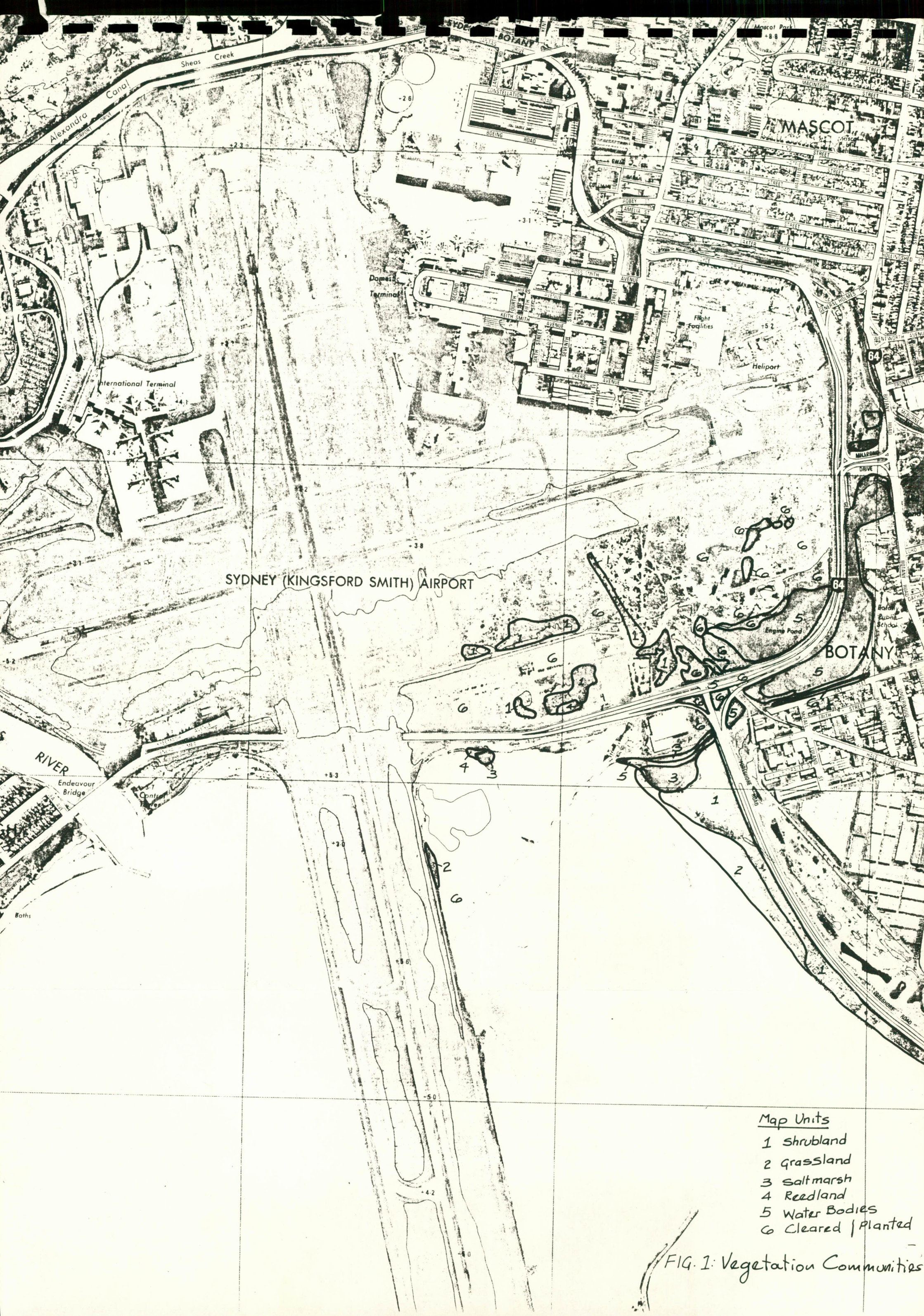
PONTEDERIACEAE
* Eichhornia crassipes

SPARGANIACEAE
Sparganium antipodum

TYPHACEAE
Typha sp.

Notes

* Introduced Species or Native Species not Indigenous to Area
? Uncertain Identification
P Species only occurring as plantings
This floristic list includes species observed by R. Lembit and wetland species recorded previously in the area of the proposed third runway by N. Wilson and D.H. Benson et al.



Map Units

1 Shrubland
2 Grassland
3 Saltmarsh
4 Reedland
5 Water Bodies
6 Cleared / Planted

FIG. 1: Vegetation Communities