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Shore Bird Census
Proposed Temporary Desalination Plants
Wyong Shire Council

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Contents

1. Introduction

As part of the Central Coast Drought Initiatives, Wyong Shire Council is investigating the installation of temporary desalination plants at three sites within the Shire:

- Budgewoi Beach South.
- Lakes Beach SLSC car park.
- Tuggerah Beach, Magenta.

This report has been prepared by Connell Wagner on behalf of Wyong Shire Council to provide information on the shore bird species assemblage and abundance, obtained during an early summer bird census, on the subject site.

1.1 Central Coast Drought Initiatives

As part of Gosford Wyong Water Authority's (GWWA) drought contingency plan, it is proposed to install temporary desalination plants, as one of the measures currently being adopted to supplement the Region's water storage levels. It is proposed to introduce temporary reverse osmosis (RO) desalination plants, in a staged "incremental" process, to meet urgent short-term water needs. The installation of the temporary desalination plants will be implemented in 2 ML/d plant increments consisting of 2 x 1 ML/d RO plants, under a managed and staged contingency plan.

Gosford and Wyong Councils are also continuing to work with drought-affected industries to help manage the impact of new water restrictions. The councils are also reducing demand through restrictions; providing recycled water for commercial usage; and detecting leaks and pressure problems in water pipes. Council is also providing rebates for fitting household tanks and efficient washing machines; subsidising the REFIT program to reduce water usage in homes; giving tanks to childcare centres and schools; conducting education and awareness programs; helping organisations apply for community water grants and businesses to audit water use; providing groundwater for Rural Fire Service training and hosting a water expo and seminars.

Wyong Council's water initiatives include:

- Water tanks and water saving devices fitted in Council facilities;
- Groundwater or recycled water used on roadworks and sports fields;
- Disconnecting beach showers and outdoor taps;
- Ensuring water efficiency while cleaning and repairing water mains; and
- Using waterless car wash products on council fleet vehicles and rainwater to clean trucks.

1.2 Study Investigations and Report Structure

The investigations have followed a relatively standard methodology, as described for the point count method (DEC 2004; York *et a*l. 1991), where by observations were made from pre-determined points for pre-determined lengths of time. The surveys targeted threatened shore bird species that were considered likely to occur in the study area, as identified in Connell Wagner (2006 a, b and c). The investigations were carried out between 11/12/2006 and 15/12/2006.

The report is organised as follows:

- **Section 2** outlines the extent of the proposed works
- **Section 3** details the methodology of the bird census

- **Section 4** presents the results of the bird census
- **Section 5** highlights the threatened species findings of the report and re-evaluates the mitigation measures in relation to shore birds.
- **Section 6** provides a conclusion of the bird census and potential consequences of the proposal
- **References** provide a list of the detailed investigations and assessments that support the report;
- **Appendices**
  - Appendix A: provides a Seven Part Test for the threatened Sooty Oystercatcher.
  - Appendix B: Shore bird census results
  - Appendix C: Site photos.

2. The Proposal

2.1 Context and Setting

2.1.1 Budgewoi Beach

The proposed temporary desalination plant is to be located within a coastal reserve off Budgewoi Road at Budgewoi Beach. As shown in Figure 2.1, the site is between the Central Coast suburbs of Toukley and Budgewoi on a narrow peninsular between the Tasman Sea to the east and Budgewoi Lake to the west. The Budgewoi Road corridor forms part of the 21 km scenic Tourist Drive No. 3 and cycle route which extends from Munmorah State Recreational Area to the north and The Entrance to the south.

The proposed desalination plant is to be situated between Budgewoi Road and the coastal dunes on a site that is relatively flat and at grade with Budgewoi Road. The site is adjoined by an existing carpark for beach access and low level scarce vegetation consisting of a mix of native and exotic species. An access path to the beach also adjoins the proposed site and distant views to Budgewoi Lake and the beach are available as the access track crosses the coastal dune.

2.1.2 Lakes Beach SLSC car park

The proposed temporary desalination plant is to be located within a coastal reserve off Budgewoi Road at Lakes Beach. As shown in Figure 2.1, the site is to the north of Norah Head and south of Budgewoi.

The study site is located in the existing main carpark for the southern end of Lakes Beach which accesses the surf club and patrolled swimming areas. It is a sealed level space with coastal native trees and shrubs in garden beds throughout the car park.

The site is bounded by the partially vegetated Budgewoi Road frontage to the west and the densely vegetated sand dunes to the north and east. A direct pedestrian access to the beach is situated adjacent to the site. A kiosk, toilet block and turfed open space are located in the southern portion of the car park.

2.1.3 Tuggerah Beach, Magenta

The temporary desalination plant is proposed to be located within a coastal reserve off Wilfred Barrett Drive at Tuggerah Beach. As shown in Figure 2.1, the site is to the north of The Entrance North and immediately south of the Magenta Shores integrated tourist and residential development.

The plant is to be situated immediately adjacent to the northern boundary of the existing car park on a flat open parcel of land. The site is essentially devoid of vegetation and elevated from Wilfred Barrett Drive. Vehicle access to the site will be from the existing car park entry. A pedestrian access to the beach is located opposite the site.

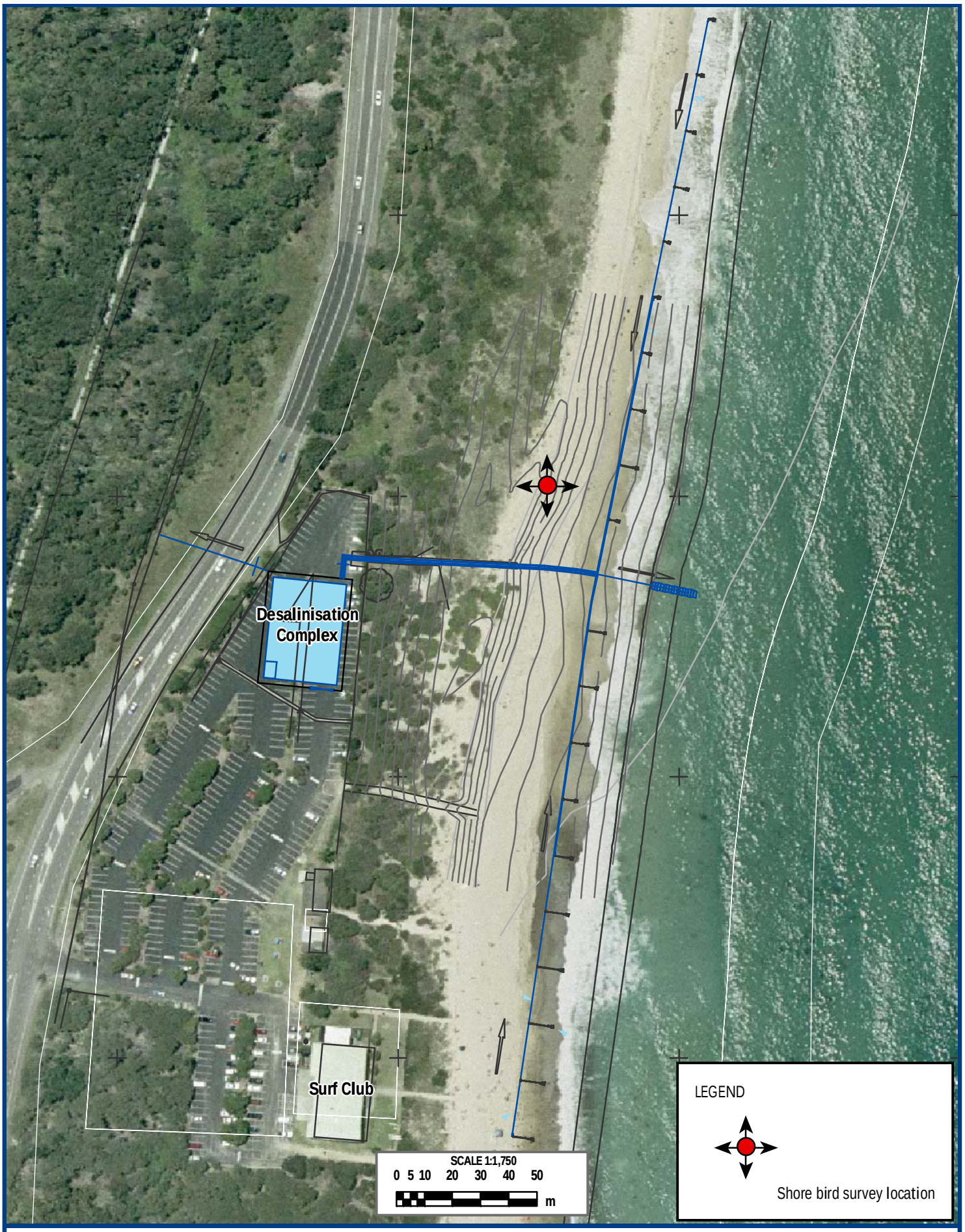
Wyong Desalination Plants
Shore Bird Survey Report

NOTE: Drawing is indicative only

SOURCE: cadastre - Department of Lands
Design - Department of Commerce

DRAFT ONLY

FIGURE 2.1a
SHORE BIRD SURVEY
BUDGEWOI



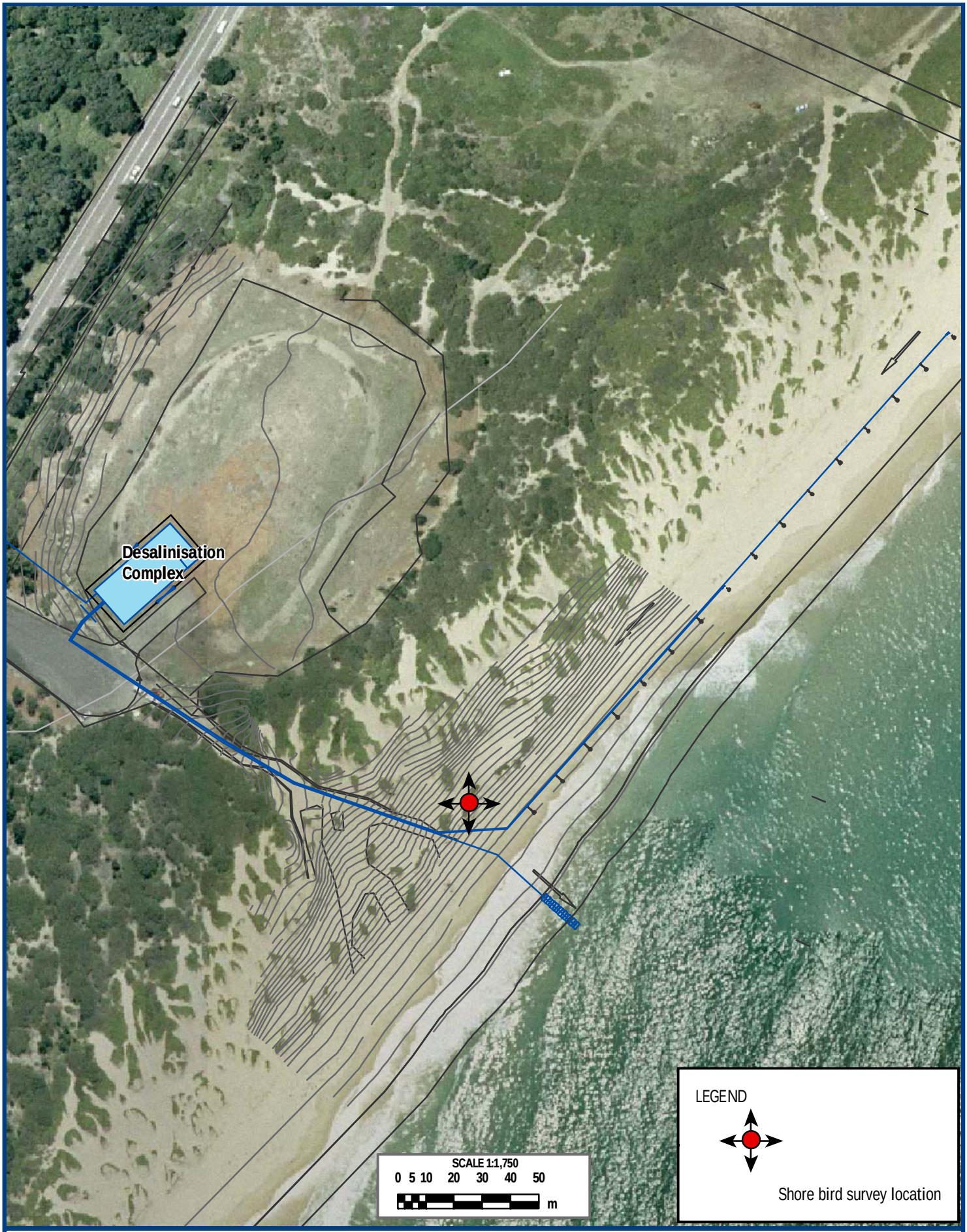
Wyong Desalination Plants
Shore Bird Survey Report

NOTE: Drawing is indicative only

SOURCE: cadastre - Department of Lands
Design - Department of Commerce

DRAFT ONLY

FIGURE 2.1b
SHORE BIRD SURVEY
LAKES BEACH



Wyong Desalination Plants
Shore Bird Survey Report

NOTE: Drawing is indicative only

SOURCE: cadastre - Department of Lands
Design - Department of Commerce

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FIGURE 2.1c
SHORE BIRD SURVEY
TUGGERAH BEACH

2.2 Desalination Process

The proposed desalination technology to be used is seawater reverse osmosis (SWRO). Reverse osmosis is the process of forcing seawater through a semi-permeable membrane under high pressure. The membrane allows fresh water to pass through while it retains salt and other impurities, which are discharged back to the ocean in the form of seawater concentrate.

Key steps in the seawater desalination process using reverse osmosis include:

- Seawater is pumped from the ocean to the desalination plant through intake structures (beach intake wells or bores).
- The seawater then passes through a pre-treatment process to remove suspended solids and other matter before the seawater reaches the reverse osmosis membranes.
- The pre-treated seawater then passes through the reverse osmosis membranes.
- The desalinated water, as with Wyong's existing drinking water, would then be treated to ensure the water meets the Australian Drinking Water Guidelines and NSW Health requirements in accordance with current practice.
- After treatment the drinking water would be pumped directly to the existing water distribution network.
- Seawater concentrate would be discharged to the ocean via an outlet designed to maximise rapid dispersion.

2.3 Description of Proposed Works

Each of the proposed plants will take up an area approximately 40 m x 20 m and have a capacity of 4 ML of product water per day at Budgewoi and Lakes Beach and 2 ML/day at Tuggerah Beach. Each plant will consist of the following components:

Seawater Intake System comprising:

- Intake bores and intake pipeline
- A seawater pumping station
- A seawater pipeline to the SWRO site

Temporary SWRO treatment plant comprising:

- Containerised pre-treatment process units
- Containerised SWRO unit
- Containerised post treatment unit (calcite filters, disinfection)
- Washwater treatment facilities
- Storage tanks for feed water, residual saline, permeate, wastewater and sludge
- Chemical dosing systems
- Electrical works
- Civil works, fencing, landscaping

Seawater concentrate pumping station, return pipeline and outfall/diffuser

Treated water pump station and pipeline

3. Methods

3.1 Database and Literature Reviews

3.1.1 Connell Wagner (2006a, b and c) – SEE: Temporary Desalinisation Plant, Budgewoi, Lakes Beach and Tuggerah Beach.

Connell Wagner (2006a, b and c) presents Statement of Environmental Effects for the temporary desalinisation plants at Budgewoi Beach, Lakes Beach and Tuggerah, respectively. Of particular relevance, is Appendix D of these reports, which provides an assessment of significance for threatened species considered likely to occur in the study areas.

Five threatened shore bird species listed on the TSC Act and four threatened bird species listed as 'migratory' on the EPBC Act were considered likely to occur within the study areas. They include:

- Sanderling (*Calidris alba*), listed under both TSC Act
- Greater Sand Plover (*Charadrius leschenaultii*), listed under TSC Act
- Lesser Sand Plover (*Charadrius mongolus*), listed under both TSC Act and EPBC Act
- Pied Oystercatcher (*Haematopus fuliginosus*), listed under TSC Act
- Little Tern (*Sterna albifrons*), listed under both TSC Act
- Eastern Curlew (*Numenius madagascariensis*) listed under EPBC Act

The above species were considered likely to occur, based on the existence of potential roosting and/or foraging and/or breeding habitat within the study area, and were assessed in the Seven Part Test and in accordance with the *Significance Impact Guidelines: Matters of National Environmental Significance* (EPBC Act Policy Statement 1.1, May 2006).

No threatened fish species listed on the FM Act were considered likely to occur within the study area. A 20 km search of the BioNet database revealed no records of threatened fish species.

Of particular note, is a known Little Tern nesting colony site, situated at Karagi Point in The Entrance to the south of the study areas. The nesting colony site will not be directly affected by the proposed activity. Inhabitants of the Little Tern colony may forage within the study area, however the potential foraging habitat to be disturbed by the proposed works is expected to be minimal.

In general, this report concluded that the extent of habitat disturbance is considered minimal, and an area of important habitat (eg nesting habitat) is not known from the study area. Furthermore, as the proposed action is temporary, the impacts are expected to be short-term. The proposed activity is unlikely to have a significant effect on these species, provided the species are not nesting in the area at the time of construction. The sites are subject to high recreational use which is likely to deter the species from nesting in the area, however it was recommended that a pre-clearance survey be undertaken to ensure no nesting within dunal habitat to be disturbed by the proposed works, eg pipeline installation.

3.1.2 Database review

A threatened species data search for the area within 10 km of the site was obtained from the National Parks and Wildlife Atlas for Wildlife (DEC 2006). This search identified 77 threatened flora and fauna, including 9 threatened shore birds. With the exception of marine mammals, birds and reptiles (excluded due to a lack of suitable habitat), all these species have been compiled and evaluated for their likelihood to occur on the subject site in Appendix D of Connell Wagner (2006 a, b and c).

An EPBC Protected Matters Report for the area identified 49 Threatened species and 41 Migratory species as likely or possible occurrences within 10 km of the study site. All these species were been compiled and evaluated for their likelihood to occur on the subject site in Appendix D of Connell Wagner (2006 a, b and c).

3.2 Field Investigations

3.2.1 Site Habitat Descriptions

Each site was assessed for habitat suitability which included factors such as beach and dune gradient, headlands and rock outcrops, creeks and estuaries, off shore islands, beach morphology, dune vegetation and observed disturbances.

3.2.2 Bird Census

A point count bird census was undertaken at each site, where by observations were made from pre-determined points for pre-determined lengths of time (DEC 2004; York *et a*l. 1991). Bird census was carried out at each observation point using 10x25 magnification binoculars for 45 minutes between 5.45 am and 7.45 am on 11/12/2006; and 13/12/2006 to 15/12/06, inclusive. The site was inspected on the morning of the 12/12/06, however only opportunistic observations were made and bird census was postponed to the following days due to unfavourable strong southeast winds and storm conditions.

Given the lack of visual obstructions on the open beaches, one observation point was established at each of the three proposed desalination plant locations (ie three sites in total – see Figure 2.1). Observations points were positioned in suitable vantage points, so that observations could be made on species that may have been up to 200 m from the observation point. Several parameters were recorded, including the species, number of individuals in a group, distance and bearing from the observation point.

3.2.3 Opportunistic Observations and Secondary Evidence

Opportunistic observations involved recording species other than shore birds and secondary evidence, such as tracks and scats, that were encountered during the bird census.

4. Results

4.1 Weather Conditions

Table 4.1 – Weather conditions during the shore bird census

Date	Temperature	Wind Direction	Wind Speed	Rainfall
11/12/06	17-24	North to northeast	10-16 knots	None recorded
12/12/06	16-18	Strong southeast winds and stormy conditions	21-37 knots	Light to moderate rainfall
13/12/06	16-22 ºC	West to west-southwest	6-15 knots	None recorded
14/12/06	18-19 ºC	Light southwest winds followed by strong northeast winds starting at 6.45am. northeast to northwest changes.	15-48 knots	Light to heavy rainfall
15/12/06	19-20ºC	South to South - south west	30-37 knots	Light

4.2 Site Habitat Descriptions

The beach morphology cross section (shore to crest of dune) at each of the three proposed temporary desalination plants is generally characterised by a short width of gently sloping beach followed by a steep fore dune. There were some areas outside of the study area that offered wider stretches of beach (ie towards the Surf Life Saving Club at Lakes Beach).

4.2.1 Site 1 – Tuggerah Beach

The census observation point was located at a high vantage point on the dune to the north of the beach access track. The beach cross section was characterised by a shore stretch of slightly sloping beach from the water edge to the foot of the fore dune, where a particularly steep incline to a high point in the dune (approximately 15 m) (see Appendix C). Spinifex Grass (*Spinifex sericeus*) and Bitou Bush (*Chrysanthemoides monilifera*) occurred on the crest of the steep incline. People and domestic dogs were occasionally observed walking along the beach and vehicle tracks were observed on the beach.

4.2.2 Site 2 – Lakes Beach

The census observation point was located at a high vantage point on the dune to the north of the beach access track. The beach cross section was characterised by a gradual incline from the water edge to the foot of the fore dune, where a steep incline preceded a gradual ascent to a high point in the dune (see Appendix C). Spinifex Grass and Bitou Bush occurred on the crest of the steep incline. People and domestic dogs were regularly observed walking along the beach and vehicle tracks were observed on the beach.

4.2.3 Site 3 – Budgewoi Beach

The Site 3 census point was located on a suitable vantage point on the dune to the north of the beach access track. The beach cross section consisted of an initial moderate steep incline from the waters edge, followed by a very gradual incline to the foot of the steep fore dune that contained numerous undulations (see Appendix C). Spinifex Grass and Bitou Bush occurred on the crest of the steep incline. People and domestic dogs were regularly observed walking over the dune, outside of the access track, and along the beach and vehicle tracks were observed on the beach.

4.3 Shore Birds

The Little Tern (*Sterna albifrons*) and Sooty Oystercatcher (*Haematopus fuliginosus*) were recorded flying over Site 1 and Site 2, respectively, and were the only threatened shore birds recorded in the census. There was no evidence of these species resting or nesting on the beach. Silver Gull (*Larus novaehollandia*) were commonly recorded resting on the beach at all sites. The Fairy Tern (*Sterna nereis*) was commonly recorded flying over at all sites. All birds recorded in the near shore environment have been recorded in Table 1 Appendix A and displayed in Figure 4.1 below.

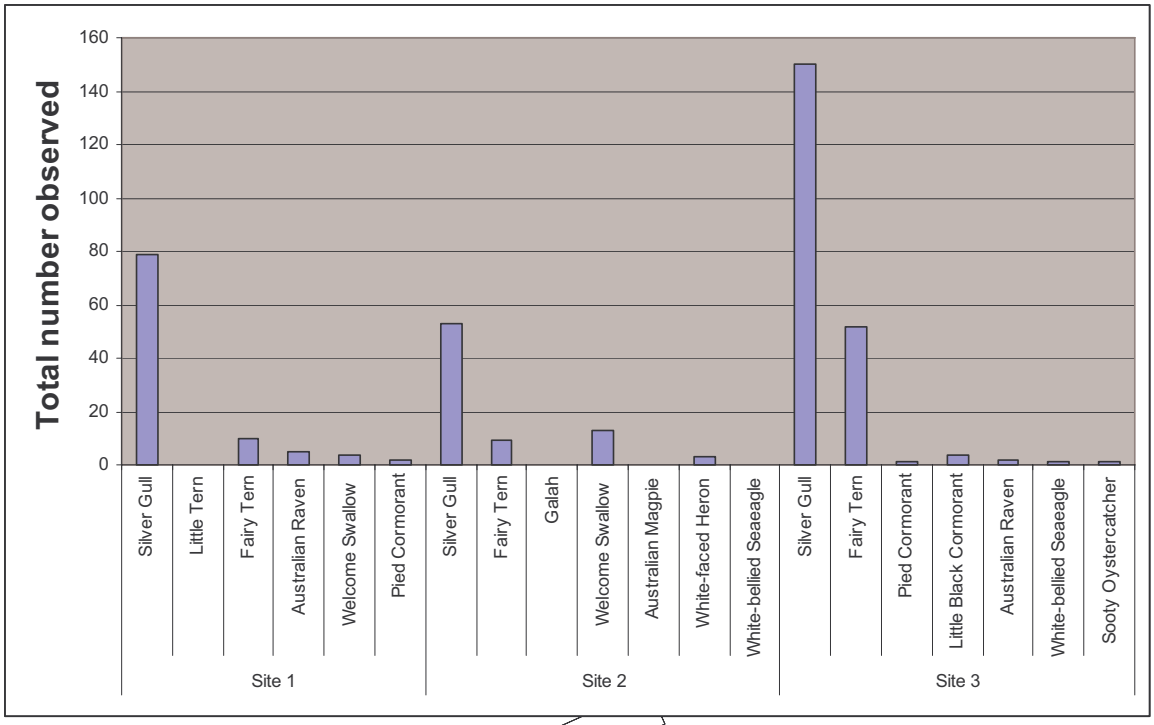

Figure 4.1: Column graph showing total species diversity and abundance recorded during the shore bird census.

4.4 Opportunistic Observations and Secondary Evidence

Site 1 was inspected on the morning of the 12/12/06, however bird census was postponed due to strong southeast winds and storm conditions. Silver Gulls, Australian Magpie and Australian Raven were opportunistically recorded during this inspection.

General observations were also recorded during the shore bird census, including several likely disturbances for shore birds, such as:

- Recreational walkers with dogs regularly used the beaches.
- Fishermen were regularly observed, particularly at Site 2 and Site 3.
- Ravens were observed raiding rubbish bins on the beach and in littoral vegetation.
- Vehicle tracks on beach at Site 2 and Site 3 most probably from Surf Life Saving Club vehicles. A beach grooming tractor was observed cleaning the beach to the south of Site 2.

5. Threatened and Migratory Shore Birds

The Little Tern (Endangered – TSC Act) and Sooty Oystercatcher (Vulnerable – TSC Act), were the only threatened shore birds recorded in this survey. The White-bellied Sea-Eagle (Migratory – EPBC Act) was recorded flying over Site 2 and Site 3, though the proposal is not considered of consequence to this species as no forage or possible vantage/roost habitat will be removed or modified. This species is not considered further.

Although there were some exceptions (ie Silver Gulls), most of the shore birds recorded during this census were fly over observations, meaning that the observed species were flying and not foraging or resting on the beach. There may be several explanations for this, including:

- Frequent recreational use that disrupts foraging, ie walkers, dogs and fishers, particularly at Site 2 and Site 3. Subtle and infrequent disturbance can keep the terns off their nests for hours.

The problems are exacerbated when people bring dogs to the site, which may prey on the eggs and young or harass the parents (NPWS 2003).

- Surf Life Saving use of Site 2, ie vehicle tracks noted on beach. Vehicular and tractor use on beaches are a known disturbance for the Little Tern (NPWS 2003).
- Nearby optimal forage and breeding habitat, ie coastal lakes and estuaries. Little Tern were observed resting at The Entrance on the 13/12/06.
- Presence of predators, ie Australian Ravens, domestic dogs.
- Weather conditions during the survey, ie shore birds seeking more sheltered areas during storms or windy conditions. The bird census was conducted during a range of weather conditions, though conditions were mostly still (ie preferable conditions). This factor is not considered likely to have substantially influenced the delectability of species.
- Inadequate season. The shore bird census was conducted in an active season (ie breeding and summer migration) for shore birds and thus season is unlikely to have reduced the delectability of species.

Despite the fact that few shorebirds were observed foraging or resting, the site is still considered to offer potential habitat for threatened and migratory shore birds, most probably as variable and intermittent forage habitat depending on the presence of forage resources (ie small fish, crustaceans, insects, annelids and molluscs) (NPWS 2003) and possibly variable beach morphology (ie shallow sand bank formation). Shore bird breeding is considered unlikely to occur on the subject sites.

Connell Wagner (2006 a, b and c) presents a Seven Part Test for those species considered likely to occur (Little Tern, Sanderling, Greater Sand, Lesser Sand Plover, Pied Oystercatcher). The Sooty Oystercatcher was not assessed according to the Seven Part Test in Connell Wagner (2006 a, b and c), as no suitable forage habitat for this species occurs on the sites. Despite this, the species was recorded in this shore bird census and, as a result, the species has been assessed in a Seven Part Test presented in Appendix A.

Provided the mitigation measures listed in Connell Wagner (2006 a,b and c) are implemented, the proposed temporary desalinisation plants are unlikely to have a significant impact on threatened or migratory shore birds listed under TSC Act and EPBC Act. In particular, pre-construction site inspection by a suitably qualified ecologist immediately prior to construction should be carried out to prevent impacts on shore birds (Connell Wagner 2006 a, b and c). It is also recommended that construction take place outside of the main breeding season for shore birds (ie spring to late summer).

6. Conclusion

The study locality offers a range of near shore habitat, with extensive areas of ocean and lake (Budgewoi Lake, Tuggerah Lake and Lake Macquarie) interfaces as well as estuaries (The Entrance, Swansea Channel). These factors are attributed to the numerous records of shore and ocean birds in the locality. However, the subject sites have all had various levels of disturbance, including sand mining, weed invasion, recreational walking of domestic dogs and fishing. Several predators were also observed or considered likely to occur in the area, including Australian Raven, domestic dog and fox.

The Little Tern, Sanderling, Greater Sand Plover, Lesser Sand Plover and Pied Oystercatcher were considered potential occurrences on the subject sites, according to Connell Wagner (2006 a,b and c). This was based on local records of the species and suitable habitat in the study area. The sites offer very marginal potential nesting habitat for the Little Tern and Pied Oystercatcher, though more optimal nesting habitat occurs in the locality, which reduces the likelihood of nesting on the subject sites. The remaining threatened and migratory species considered likely to occur are non-breeding migrants to Australia.

This shore bird census was conducted in a typically active period for birds (ie spring summer period), with many shore bird species known to breed or migrate to the region within this period (Little Tern, Oystercatchers, Sanderling). The Little Tern and Sooty Oystercatcher, listed as endangered and

vulnerable respectively under the TSC Act, were recorded flying over Site 1 and Site 3 respectively, but not foraging or resting on the beach near the subject sites.

The impacts of the proposal on Little Tern, Sanderling, Greater Sand Plover, Lesser Sand Plover and Pied Oystercatcher have been assessed according to the Seven Part Test in Connell Wagner (2006 a, b and c), however the Sooty Oystercatcher was not considered likely to occur on the site and was not assessed. A Seven Part Test for the Sooty Oystercatcher has been provided in Appendix A of this report due to the observation of the species flying over Site 3.

Provided the mitigation measures listed in Connell Wagner (2006 a,b and c) are implemented, the proposed temporary desalinisation plants are unlikely to have a significant impact on threatened or migratory shore birds listed under TSC Act and EPBC Act. In particular, pre-construction site inspection by a suitably qualified ecologist immediately prior to construction should be carried out to prevent impacts on shore birds (Connell Wagner 2006 a, b and c). It is also recommended that construction take place between March and August, outside of the known breeding season of Little Tern, Sooty and Pied Oystercatcher. The remaining shorebird species considered likely to occur in the study area are non-breeding migrants to Australia and thus the proposal will not affect the breeding for these species.

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Appendix A

Assessment of Significance Seven Part Test

Appendix A

Seven Part Test of Significance

For the purposes of the EP&A Act and, in particular, in the administration of sections 78A, 79B, 79C, 111 and 112, the following factors, known as the 'Seven Part Test', must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats.

Relevant aspects of the ecology of species potentially affected by the proposal, followed by an assessment of the proposal on these species according to the seven factors listed in Section 5A of the EP&A Act, are provided below.

Sooty Oystercatcher (*Haematopus fuliginosus*)

Sooty Oystercatchers are found around the entire Australian coast, including offshore islands, being most common in Bass Strait. Small numbers of the species are evenly distributed along the NSW coast. The availability of suitable nesting sites may limit populations (DEC 2005).

The Sooty Oystercatcher favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels (Marchant and Higgins 1993, Simpson And Day 1999), which are prised apart with their specially adapted bills. Food is found by sight, or by probing their long, chisel-shaped bills in the mud. Breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories. The nest is a shallow scrape on the ground, or small mounds of pebbles, shells or seaweed when nesting among rocks (DEC 2005).

Several threats have been identified by the Department of Environment (DEC 2005), including:

- Disturbance to coastal feeding, nesting and roosting areas through beach-combing, fishing, dog-walking, horse-riding and 4WD vehicles.
- Predation of eggs and chicks by foxes, dogs, cats, rats and raptors.
- Habitat destruction as a result of residential, agricultural and tourism developments.
- Hydrological changes to estuaries and similar water bodies causing modification or removal of important areas of suitable habitat.

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

A single Sooty Oystercatcher was recorded flying north to south to the east of observation Site 3. This individual was not recorded foraging or resting on the beach and is considered likely to have been traversing between areas of more suitable rocky forage habitat. The action proposed is unlikely to have an adverse effect on the life cycle of the Sooty Oystercatcher such that a viable local population of the species is likely to be placed at risk of extinction, provided the species is not nesting in the study area during construction activities. It is therefore recommended that a pre-clearance survey be undertaken to ensure no Sooty Oystercatcher are within dunal habitats during construction.

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

No endangered population is relevant to the study area.

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

- *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

No endangered ecological community or critically endangered ecological community is relevant to the study area.

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

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

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

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

The subject sites have not been identified to support the Sooty Oystercatcher as the species was recorded flying over and not actually foraging or nesting in these areas. The sites do not offer suitable nesting habitat and only very marginal foraging habitat is available in these areas. The species is considered more likely to utilise more preferred habitats on near by rock platforms, headlands and islands and thus the sites are not considered important habitat. The Sooty Oystercatcher is considered unlikely to be significantly affected by the proposed action and the extent of this habitat disturbance is considered minimal. Furthermore, the proposed action is temporary and pre-construction inspections by a suitably qualified ecologist should prevent impacts on this species.

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

No areas identified under the TSC Act as 'critical habitat' will be affected by the proposed activity.

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

Neither a recovery plan or threat abatement plan has been prepared for the Sooty Oystercatcher. The proposed temporary desalinisation plants and infrastructure will involve short-term disturbance of marginally suitable potential forage habitat for this species and mitigation measures will prevent direct impacts to this species. The proposal is not considered likely to significantly contribute to identified threats for this species.

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

The proposed action does not constitute, nor is it part of a key threatening process, nor is it likely to result in the operation of, or increase the impact of, a key threatening process.

Appendix B

Shore Bird Census Results

Appendix B

Bird Census results

Date	Time	Species	Common Name	No. of	Distance from site (m)	Bearing	Comments
Site 1							
11/12	6.20-7.05am	*Larus novaehollandia*	Silver Gull	1 1 1 1 1 2 2 1	15-20 15-20 15-20 15-20 15-20 15-20 10-15 10-15	090 090 045 090 090 045 090 090	Fly over Fly over Fly over Fly over north to south Fly over southwest to northwest Fly over south to north On beach
		Corvus coronoides	Australian Raven	1	50	280	Fly over
		Hirundo neoxena	Welcome Swallow	3 1	50 10-15	Southwest to northwest. Southwest to northwest	Fly over
13/12/06	6.07-6.50	*Corvus coronoides*	Australian Raven	1	400	030	On beach
		Larus novaehollandia	Silver Gull	3	15-20	North to south	Fly over
		Larus novaehollandia	Silver Gull	2	15-20	North to south	Fly over
		Larus novaehollandia	Silver Gull	6	15-20	North to south	Fly over
		Larus novaehollandia	Silver Gull	2	15-20	North to south	Fly over
		Sterna nereis	Fairy Tern	1	20	North to south	Fly over
		Phalacrocorax varius	Pied Cormorant	1	300	140	Fly over
		Sterna albifrons	**Little Tern**	**1**	**30**	**North to south**	**Fly over**
		Larus novaehollandia	Silver Gull	1	30-35	140	On beach

14/12/06	6.20-7.05am	*Larus novaehollandia*	Silver Gull	1	15-20	090	On beach
		Larus novaehollandia	Silver Gull	2	25-35	045	On beach
		Sterna nereis	Fairy Tern	2	300-400	145	Fly over
		Larus novaehollandia	Silver Gull	3	15-20	South to north	Fly over
		Sterna nereis	Fairy Tern	3	50-400	145	Fly over
		Sterna nereis	Fairy Tern	2	50-100	North to south	Fly over
		Larus novaehollandia	Silver Gull	7	25-30	North to south	Fly over
		Sterna nereis	Fairy Tern	2	50-100	North to south	Fly over
		Phalacrocorax varius	Pied Cormorant	1	500	South to north	Fly over
		Larus novaehollandia	Silver Gull	3	20-25	North to south	Fly over
		Larus novaehollandia	Silver Gull	11	50-100	North to south	Fly over
		Larus novaehollandia	Silver Gull	1	15-20	South to north	Fly over
		Larus novaehollandia	Silver Gull	1	15-20	West to south	Fly over
15/12/06	6.15-7.00	*Larus novaehollandia*	Silver Gull	4	50	Southeast	Fly over
		Larus novaehollandia	Silver Gull	1	10-15	North to south	Fly over
		Larus novaehollandia	Silver Gull	1	15-20	East	On beach
		Larus novaehollandia	Silver Gull	1	200	North to south	Fly over
		Larus novaehollandia	Silver Gull	1	5-10	North to south	Fly over
		Larus novaehollandia	Silver Gull	1	0-5	North to south	Fly over

		Larus novaehollandia	Silver Gull	2	20-25	125	On beach
		Larus novaehollandia	Silver Gull	2	15-20	South to north	Fly over
		Larus novaehollandia	Silver Gull	1	200-300	045	On beach
		Larus novaehollandia	Silver Gull	1	300-500	090	Flyover
		Larus novaehollandia	Silver Gull	1	50-60	South to north	Flyover
		Larus novaehollandia	Silver Gull	2	0-5	North to south	Flyover
		Larus novaehollandia	Silver Gull	1	25-30	045	On beach
		Larus novaehollandia	Silver Gull	1	30-35	North to south	Fly over
		Larus novaehollandia	Silver Gull	1	50-60	South to northeast	Flyover
		Larus novaehollandia	Silver Gull	4	100	South to north	Flyover
		Corvus coronoides	Australian Raven	3	300-500	290	Flyover
		Larus novaehollandia	Silver Gull	1	0-5	090	Flyover
Site 2							
11/12/06	*6.00-6.45am*	*Larus novaehollandia*	Silver Gull	7 4 5 3	30-35 200 250 130	075 020 025 180	Sitting on beach, mostly near fishers.
		Sterna nereis	Fairy Tern	2	80	090	flyover north to south
		Gymnorhina tibicen	Australian Magpie	8	150	180	Foraging on beach and fore dune
		Hirundo neoxena	Welcome Swallow	1	10	180	flyover

		Egretta novaehollandiae	White-faced Heron	2	Flew over the site	Flew over the site	flyover
		Cacatua roseicapillus	Galah	12	80	180	Foraging in fore dune
		Haliaeetus leucogaster	White-breasted Sea Eagle	2	150	120	Flyover east to southeast.
13/12/06	6.45-7.30am	*Larus novaehollandia*	Silver Gull	1	15-20	090	Flyover north to south
		Hirundo neoxena	Welcome Swallow	3	10-15	090	Fly over south to north
		Larus novaehollandia	Silver Gull	3	10-15-100	010	On beach and wandering
		Corvus coronoides	Australian Raven	1	20-25	240	Fly over
		Larus novaehollandia	Silver Gull	1	10-15	090	Fly over north to south
		Sterna nereis	Fairy Tern	1	10-15	090	Fly over south to north
		Cacatua roseicapillus	Galah	4	35	165	On beach foraging on Spinafex
		Haliaeetus leucogaster	White-breasted Sea Eagle	1	10	090	Fly over
		Hirundo neoxena	Welcome Swallow	2	25-30	045	Fly over
		Larus novaehollandia	Silver Gull	1	5	090	Fly over
		Gymnorhina tibicen	Australian Magpie	3	100	180	On beach
		Larus novaehollandia	Silver Gull	4	120	180	On beach
		Hirundo neoxena	Welcome Swallow	4	15-25	090	Fly over north to south
14/12/06	7.00 - 7.45am	*Phalacrocorax varius*	Pied Cormorant	2	20	090	Fly over north to south

		Larus novaehollandia	Silver Gull	2	5	Over the site	Fly over
		Larus novaehollandia	Silver Gull	3	10-15	090	On beach
		Sterna nereis	Fairy Tern	1	10-15	010	Fly over
		Larus novaehollandia	Silver Gull	5	15-20	090	Fly over north to south
		Phalacrocorax varius	Pied Cormorant	2	30-40	280	Fly over northwest to southeast
		Phalacrocorax varius	Pied Cormorant	1	250	090	Fly over south to north
15/12/06	6.45-7.30am	*Larus novaehollandia*	Silver Gull	15	180	180	On beach
		Corvus coronoides	Australian Raven	3	50	045	On beach
		Hirundo neoxena	Welcome Swallow	3	20	150	Flyover
		Sterna nereis	Fairy Tern	1	40	010	Flyover north to southwest
		Sterna nereis	Fairy Tern ?	1	40	090	Flyover east to west
		Sterna nereis	Fairy Tern	2	40	090	Flyover east to west
		Larus novaehollandia	Silver Gull	4	35-40	090	flyover
		Sterna nereis	Fairy Tern	1	40	090	Flyover north to south
		Larus novaehollandia	Silver Gull	4	50-60	090	Flyover north to south
		Larus novaehollandia	Silver Gull	8	40-50	090	Flyover north to south
		Larus novaehollandia	Silver Gull	3	100	015	On beach
		Egretta novaehollandiae	White-faced Heron	1	25	145	flyover
		Phalacrocorax sulcirostris	Little Black Cormorant	1	30	090	Flyover

		Larus novaehollandia	Silver Gull	6	25 – beached 180m	090	Flyover to beach
		Larus novaehollandia	Silver Gull	2	25	145	On beach
Site 3							
11/12/06	7.00-7.75am	*Sterna nereis*	Fairy Tern	4	50	090	Fly over north to south.
		Larus novaehollandia	Silver Gull	1 1	20 150	150 150	Fly over
		Phalacrocorax varius	Pied Cormorant	1	50	075	Fly over
		Phalacrocorax sulcirostris	Little Black Cormorant	2	50	075	Fly over
		Haliaeetus leucogaster	White-bellied Sea-eagle	1	300	150	Fly over
13/12/06	5.45-6.30am	*Sterna nereis*	Fairy Tern	3	25-30	015	Fly over, northeast to southwest
		Sterna nereis	Fairy Tern	6	25-30	090	Fly over north to south
		Phalacrocorax sulcirostris	Little Black Cormorant	1	10-15	090	Fly over north to south
		Corvus coronoides	Australian Raven	1	25-30	000	Fly over
		Larus novaehollandia	Silver Gull	1	10-15	090	Fly over, south to north
		Larus novaehollandia	Silver Gull	1	35-40	090	Fly over south to north
		Larus novaehollandia	Silver Gull	1	50	090	Fly over north to south
		Corvus coronoides	Australian Raven	1	35-40	280	Fly over north to south
		Larus novaehollandia	Silver Gull	5	10-30	270	Fly over north to south
		Sterna nereis	Fairy Tern	1	15-20	090	Fly over east to west

		Sterna nereis	Fairy Tern ?	3	30-40	280	Fly over northeast to southwest
		Larus novaehollandia	Silver Gull	1	100	000	beach
		Larus novaehollandia	Silver Gull	1	50	000	Fly over northeast to southwest
		Sterna nereis	Fairy Tern	2	50	000	Fly over northeast to southwest
		Larus novaehollandia	Silver Gull	1	20	090	Fly over south to north
		Larus novaehollandia	Silver Gull	1	10	090	Fly over south to north
		Sterna nereis	Fairy Tern	1	35-40	270	Fly over northeast to southwest
		Larus novaehollandia	Silver Gull	10	5-10	090	Flyover north to south
		Sterna nereis	Fairy Tern	1	30-40	270	Flyover north to south
		Haematopus fuliginosus	**Sooty Oystercatcher**	**1**	**40-50**	**090**	**Flyover northeast to southwest**
		Larus novaehollandia	Silver Gull	1	10-15	090	Flyover north to south
		Larus novaehollandia	Silver Gull	1	10-15	090	Flyover north to south
14/12/06	6.00-6.45am	*Sterna nereis*	Fairy Tern ?	3	60	280	Flyover northeast to southwest
		Larus novaehollandia	Silver Gull	9	20-30	090	Flyover south to north
		Larus novaehollandia	Silver Gull	45	30-200	010	On beach scattered and wandering
		Larus novaehollandia	Silver Gull	3	10	090	On beach
		Larus novaehollandia	Silver Gull	25	30-100	170	On beach scattered and wandering

		Sterna nereis	Fairy Tern ?	6	5-10	090	Flyover east to west
		Sterna nereis	Fairy Tern	1	5-8	090	Flyover
		Sterna nereis	Fairy Tern	1	5-8	090	Flyover east to west
		Sterna nereis	Fairy Tern	1	10	010	Flyover east to west
		Larus novaehollandia	Silver Gull	4	15	010	On beach
		Sterna nereis	Fairy Tern	1	10	070	Flyover
		Sterna nereis	Fairy Tern	1	10	090	Flyover east to west
15/12/06	5.45-6.30	*Larus novaehollandia*	Silver Gull	9	8	090	On beach
		Larus novaehollandia	Silver Gull	11	50	045	On beach
		Larus novaehollandia	Silver Gull	8	60	170	On beach
		Phalacrocorax sulcirostris	Little Black Cormorant	1	30	090	Flyover north to south
		Sterna nereis	Fairy Tern	1	30	090	Flyover northeast to southwest
		Sterna nereis	Fairy Tern	2	30	090	Flyover northeast to southwest
		Sterna nereis	Fairy Tern	3	25-30	090	Flyover northeast to southwest
		Sterna nereis	Fairy Tern	1	200	090	Flyover north to south
		Sterna nereis	Fairy Tern	1	5-8	015	Flyover northeast to southwest
		Sterna nereis	Fairy Tern	2	250	090	Flyover north to south
		Sterna nereis	Fairy Tern	1	25-30	090	Flyover north to south
		Sterna nereis	Fairy Tern	4	15-20	090	Flyover northeast to southwest
		Sterna nereis	Fairy Tern	2	25	015	Flyover northeast to southwest
		Larus novaehollandia	Silver Gull	10	150	170	On beach

Appendix C

Site Photos

Plate 1: Site 1 beach cross section.

Plate 2: Site 2 beach cross section.

Plate 3: Site 3 beach cross section.