STATE COMMISSION ASSESSMENT PANEL
A COMMITTEE OF THE STATE PLANNING COMMISSION

APPLICATION ON NOTIFICATION – CROWN DEVELOPMENT

Applicant:	AGL Energy Limited
Development Number:	010/V067/17
Nature of Development:	Construction of a power station (2 stages) comprising a total generation capacity of 420 MW. Each stage shall comprise of 12 x 18 MW reciprocating engines generating 210 MW and associated earthworks.
Type of development:	Section 49 - Public Infrastructure
Zone / Policy Area:	Public Purpose (Power Station) Zone
Subject Land:	Q302 in DP 55734 Grand Trunkway, Torrens Island
Contact Officer:	Darby Schultz
Phone Number:	(08) 7109 7330
Start Date:	8 November 2017
Close Date:	29 November 2017
During the notification period, hard copies of the application documentation can be viewed at the Department of Planning, Transport and Infrastructure, Level 5, 50 Flinders Street, Adelaide during normal business hours.	

Written representations must be received by the close date (indicated above) and can either be posted, hand-delivered, faxed or emailed to the State Commission Assessment Panel (SCAP). A representation form is provided as part of this pdf document.

Any representations received after the close date will not be considered.

Postal Address:
The Secretary
State Commission Assessment Panel
GPO Box 1815
ADELAIDE SA 5001

Street Address:
Development Division
Department of Planning, Transport and Infrastructure
Level 5, 50 Flinders Street
ADELAIDE

Email Address: scapadmin@sa.gov.au
Fax Number: (08) 8303 0753

LOGO The Government of South Australia

DEVELOPMENT ACT 1993

NOTICE OF APPLICATION FOR CONSENT TO DEVELOPMENT

SECTION 49 – PUBLIC INFRASTRUCTURE

Notice is hereby given that an application has been made by **AGL Energy Limited** for consent to the construction of a power station (2 stages) comprising a total generation capacity of 420 MW. Each stage shall comprise of 12 x 18 MW reciprocating engines generating 210 MW and associated earthworks. **Development Number: 010/V067/17.**

The development site is located on land adjacent to the existing AGL Torrens Island Power Station, Grand Trunkway, Torrens Island (being Piece 302 in Deposited Plan 55734: Certificate of Title: Volume 6168 Folio 491)

The subject land is situated within the Public Purpose (Power Station) Zone of the Land Not Within a Council Area (Metropolitan) Development Plan (Consolidated 5 May 2016).

The application may be examined during normal office hours at the office of the State Commission Assessment Panel, Level 5, 50 Flinders Street, Adelaide. Application documentation may also be viewed on the State Commission Assessment Panel (SCAP) website: www.saplanningcommission.sa.gov.au/scap.

Any person or body who desires to do so may make representations concerning the application by notice in writing delivered to the Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide 5001 **NOT LATER THAN Wednesday 29 November 2017**. Submissions may also be made via email to: scapadmin@sa.gov.au

Each person or body making a representation should state the reason for the representation and whether that person or body wishes to be given the opportunity to appear before the SCAP to further explain the representation.

Submissions may be made available for public inspection.

Should you wish to discuss the application and the public notification procedure please contact Darby Schultz on 7109 7330.

Penny Pearce
A/SECRETARY
STATE COMMISSION ASSESSMENT PANEL
www.saplannningcommission.sa.gov.au/asap

PUBLISHED IN: Adelaide Advertiser & Portside Messenger
PUBLICATION DATE: **8 November 2017**

DEVELOPMENT ACT, 1993
S49– CROWN DEVELOPMENT
REPRESENTATION ON APPLICATION

Applicant:	AGL Energy Limited
Development Number:	010/V067/17
Nature of Development:	Construction of a power station (2 stages) comprising a total generation capacity of 420 MW. Each stage shall comprise of 12 x 18 MW reciprocating engines generating 210 MW and associated earthworks
Zone / Policy Area:	Public Purpose (Power Station) Zone
Subject Land:	Grand Trunkway, Torrens Island Q302 in DP 55734 (CT: 6168/491)
Contact Officer:	Darby Schultz
Phone Number:	7109 7330
Close Date:	29 November 2017

My name:_____

My phone number: _____

PRIMARY METHOD(s) OF CONTACT: Email address: _____

Postal address: _____

_____Postcode _____

You may be contacted via your nominated PRIMARY METHOD(s) OF CONTACT if you indicate below that you wish to be heard in support of your submission.

My interests are:
[ ] owner of local property
[ ] occupier of local property
[ ] a representative of a company/other organisation affected by the proposal
[ ] a private citizen

The address of the property affected is .....Postcode.....

The specific aspects of the application to which I make comment on are: .....

.....

.....

.....

.....

.....

.....

.....

I
[ ] wish to be heard in support of my submission
[ ] do not wish to be heard in support of my submission
(Please tick one)

by
[ ] appearing personally
[ ] being represented by the following person : .....
(Cross out whichever does not apply)

Date: ..... Signature: .....

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

SECTION 49 & 49A – CROWN DEVELOPMENT
DEVELOPMENT APPLICATION FORM

PLEASE USE BLOCK LETTERS

COUNCIL: Land Not Within a Council Area (Metropolitan)

APPLICANT: AGL Energy Limited

ADDRESS: Level 24, 200 George St, Sydney, NSW 2000

CROWN AGENCY: Department of the Premier and Cabinet

FOR OFFICE USE

DEVELOPMENT No: _____

PREVIOUS DEVELOPMENT No: _____

DATE RECEIVED: / /

CONTACT PERSON FOR FURTHER INFORMATION

Name: Robert Connell

Telephone: 0499 082 448 [work] _____ [Ah]

Fax: _____ [work] _____ [Ah]

Email: rconnell@agl.com.au

NOTE TO APPLICANTS:

(1) All sections of this form must be completed. The site of the development must be accurately identified and the nature of the proposal adequately described. If the expected development cost of this Section 49 or Section 49A application exceeds $100,000 (excl. fit-out) or the development involves the division of land (with the creation of additional allotments) it will be subject to those fees as outlined in Item 1 of Schedule 6 of the *Development Regulations 2008*. Proposals over $4 million (excl. fit-out) will be subject to public notification and advertising fees.
(2) Three copies of the application should also be provided.

☐ Complying	Decision: _____
☐ Merit	Type: _____
☐ Public Notification	Finalised: / /
☐ Referrals	

	Decision required	Fees	Receipt No	Date
Planning:				
Land Division:				
Additional:				
Minister's Approval				

EXISTING USE: Power Station

DESCRIPTION OF PROPOSED DEVELOPMENT: To construct a new power station with two stages of development. Each 210MW stage will consist of 12 reciprocating engines with a total combined capacity of approximately 420MW.

LOCATION OF PROPOSED DEVELOPMENT:

House No: _____ Lot No: ____ Street: _____ Town/Suburb: _____

Section No [full/part] D55734 Q302 (Lot 302) Hundred: Port Adelaide Volume: CT 6168 Folio: 491

Section No [full/part] _____ Hundred: _____ Volume: _____ Folio: _____

LAND DIVISION:

Site Area [m^2] _____ Reserve Area [m^2] _____ No of existing allotments _____

Number of additional allotments [excluding road and reserve]: _____ Lease: **YES** ☐ **NO** ☐

DEVELOPMENT COST [do not include any fit-out costs]: $ $295m

POWERLINE SETBACKS: Pursuant to Schedule 5 (2a)(1) of the *Development Regulations 2008*, if this application is for a building it will be forwarded to the Office of the Technical Regulator for comment unless the applicant provides a declaration to confirm that the building meets the required setback distances from existing powerlines. The declaration form and further information on electricity infrastructure and clearance distances can be downloaded from the DPLG website (www.dac.sa.gov.au).

I acknowledge that copies of this application and supporting documentation may be provided to interested persons in accordance with the *Development Act 1993*.

SIGNATURE: _____ Dated: 3/10/17

DEVELOPMENT REGULATIONS 1993
Form of Declaration
(Schedule 5 clause 2A)

To: State Commission Assessment Panel

From: AGL Energy Limited

Date of Application: 3 / 10 / 17

Location of Proposed Development: Torrens Island

House No: ..... Lot No: 302 Street: .....Town/Suburb..... ....

Section No (full/part): D55734 Hundred: Port Adelaide

Volume: CT 6168 Folio: 491

Nature of Proposed Development: To construct a new power station with two stages of development. Each 210MW stage will consist of 12 reciprocating engines with a total combined capacity of approximately 420MW.

I Robert Cowell **..being ~~the applicant/~~ a person acting on behalf of the applicant (delete the inapplicable statement) for the development described above declare that the proposed development will involve the construction of a building which would, if constructed in accordance with the plans submitted, not be contrary to the regulations prescribed for the purposes of section 86 of the *Electricity Act 1996*. I make this declaration under clause 2A(1) of Schedule 5 of the *Development Regulations 1993*.**

Date: 3 / 10 / 17

Signed: .....

Note 1
This declaration is only relevant to those development applications seeking authorisation for a form of development that involves the construction of a building (there is a definition of 'building' contained in section 4(1) of the *Development Act 1993*), other than where the development is limited to –

a) an internal alteration of a building; or
b) an alteration to the walls of a building but not so as to alter the shape of the building.

Note 2
The requirements of section 86 of the *Electricity Act 1996* do not apply in relation to:

a) a fence that is less than 2.0 m in height; or
b) a service line installed specifically to supply electricity to the building or structure by the operator of the transmission or distribution network from which the electricity is being supplied.

Note 3
Section 86 of the *Electricity Act 1996* refers to the erection of buildings in proximity to powerlines. The regulations under this Act prescribe minimum safe clearance distances that must be complied with.

Note 4
The majority of applications will not have any powerline issues, as normal residential setbacks often cause the building to comply with the prescribed powerline clearance distances. Buildings/renovations located far away from powerlines, for example towards the back of properties, will usually also comply.

Particular care needs to be taken where high voltage powerlines exist; where the development:

- is on a major road;
- commercial/industrial in nature; or
- built to the property boundary.

Note 5
Information brochures 'Powerline Clearance Declaration Guide' and 'Building Safely Near Powerlines' have been prepared by the Technical Regulator to assist applicants and other interested persons. Copies of these brochures are available from council and the Office of the Technical Regulator. The brochures and other relevant information can also be found at www.technicalregulator.sa.gov.au

Note 6
In cases where applicants have obtained a written approval from the Technical Regulator to build the development specified above in its current form within the prescribed clearance distances, the applicant is able to sign the form.

AGL Energy Limited
ABN: 74 115 061 375
Level 24, 200 George St
Sydney NSW 2000
Locked Bag 1837
St Leonards NSW 2065
t: 02 9921 2999
f: 02 9921 2552
agl.com.au

3 October 2017

Ms Simone Fogarty

Presiding Member

State Commission Assessment Panel

GPO Box 1815

Adelaide SA 5000

RE: Submission of Application for Development Approval for Barker Inlet Power Station

Attention: Ms Zoe Delmenico; via Email: Zoe.Delmenico@sa.gov.au

Copy: Mr Martyn England; via Email: Martyn.England@sa.gov.au

Dear Ms Fogarty, Ms Delmenico and Mr England

AGL Energy is pleased to submit the attached application for Development Approval for a new power station to replace the A Station at Torrens Island Power Station (TIPS) which has seen 50 years of service. The new power station, to be known as Barker Inlet Power Station, will be located adjacent to AGL's existing power station at Torrens Island.

This application for development approval is being made under Section 49 — Crown Development and Public Infrastructure of the *Development Act 1993* (Act) as it meets the definition of "public infrastructure" as outlined in Section 49(1)(a) of that Act.

An approval for an expansion project in the same location was previously granted under Section 49 of the Act and sponsored by the Department for Transport, Energy and Infrastructure (010/V008/10). AGL has been advised by the Department for Planning, Transport and Infrastructure that the proposed BIPS project will require a new application under Section 49 of the Act.

The Department of Premier and Cabinet has written to AGL offering support and endorsement for the development, pursuant to Section 49(2)(c) of the Development Act 1993 for the works as outlined below:

> Two stages with a total generation capacity of approximately 420MW. Stage 1 comprises of 12 x 18MW engines capable of providing 210MW. Stage 2 comprises of an additional 12 x 18MW engines capable of providing 210MW. The configuration would also have the option of diesel firing.

The Office of the Technical Regulator has provided a Certificate for Development of the Barker Inlet Power Station under Section 37 of the Development Act 1993.

AGL has prepared an Environmental and Social Assessment Report (ESAR) for the proposed development which is included in this transmittal.

We are available to discuss should further clarification be required at this stage, please contact the undersigned on 02 9921 2419 or by email at rconnell@agl.com.au.

With best regards,

Robert Connell
Manager Power Development

Attachments:
1 – Development Application Form
2 – Form of Declaration (Schedule 5 clause 2A)
3 – Environmental and Social Assessment Report (ESAR) with appendices

Appendix A

Section 49 Public infrastructure endorsement

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Government of South Australia
Department of the Premier and Cabinet

D170107696

GPO Box 2343
Adelaide SA 5001
DX 56201
Tel 08 8226 3500
Fax 08 8226 3535
www.dpc.sa.gov.au

13 September 2017

Mr Robert Connell
Manager Power Development
AGL Energy Limited
Level 24, 200 George Street
Sydney, NSW 2000
Locked Bag 1837
St Leonards, NSW 2065

Dear Mr Connell,

RE: BARKER INLET POWER STATION

I refer to your letter of 4 September 2017 regarding the request for support and specific endorsement pursuant to Section 49(2)(c) of the *Development Act 1993* for the proposed Barker Inlet Power Station.

Given that the proposed works meet the definition of "public infrastructure" as outlined in Section 49(1)(a) of *Development Act 1993,* and the project will provide additional back-up to the State's existing power generation supply, I am prepared to support and specifically endorse, pursuant to Section 49(2)(c) of the *Development Act 1993,* the works as detailed below:

Two stages with a total generation capacity of approximately 420MW. Stage 1 comprises of 12 x 18MW engines capable of providing 210MW. Stage 2 comprises of an additional 12 x 18MW engines capable of providing 210MW. The configuration would also have the option of diesel firing.

A conceptual site layout of these works is detailed in attachment 1.

The Department of the Premier and Cabinet make no representations or gives no warranties in relation to the outcome of the development application or time that it takes to secure a planning outcome for the project.

It is AGL Energy's responsibility to obtain all other statutory approvals, licences and permits from relevant authorities, manage community expectations and to fund the project. The State Government makes no commitment to purchase any product or service related to the project.

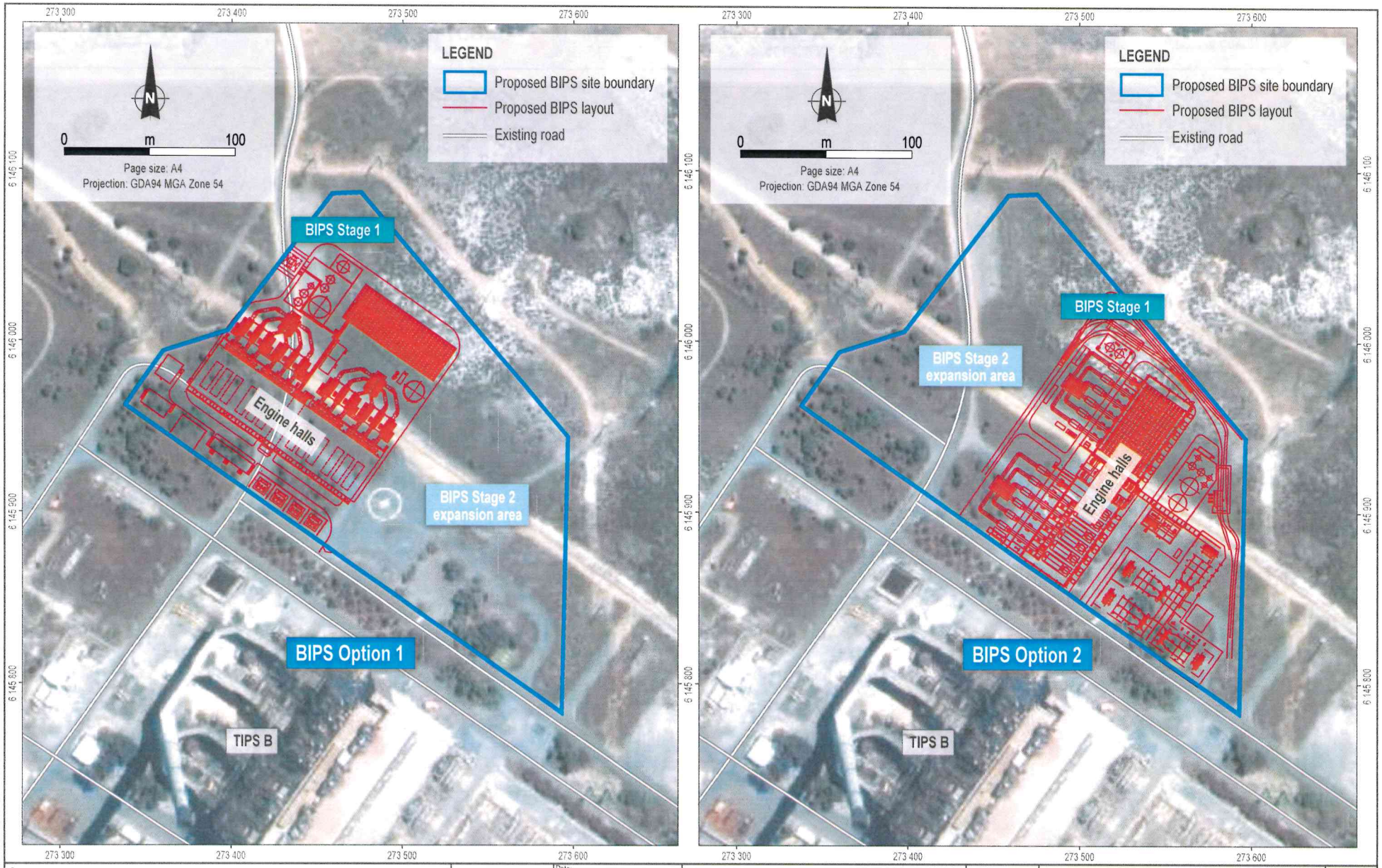
A development application must be lodged by AGL Energy at its cost with the Development Assessment Commission on or prior to 21 September 2018. If this is not achieved by that time, my support under Section 49(2)(c) of the *Development Act 1993* for the Barker Inlet Power Station project works will lapse.

Please contact Mr Chris Lim, Case Manager Delivery & Engagement, Department of State Development if you have any queries in relation to this advice or require further information. He can be contacted on (08) 82078762, mobile 0439 873 104 or email chris.lim@sa.gov.au

Yours sincerely,

Dr Don Russell
CHIEF EXECUTIVE

Attachment 1: conceptual site layout from Figure 4.3 BIPS letter (D17025438)



Source:
Aerial photography and infrastructure data from AGL.

coffey
A TETRA TECH COMPANY

Date: 23.08.2017
Project: 754-BNEEN202225
File Name: 202225_06_F04.03_GRA

AGL Energy Limited

Barker Inlet Power Station

agl

Conceptual site layout options - Stage 1

Figure No: 4.3

Appendix B

Office of the Technical Regulator Certificate

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Government of South Australia
Department of the Premier and Cabinet

Ref: 2017/01873.01 D17024351

Energy and Technical Regulation

Office of the Technical Regulator

Level 8, 11 Waymouth Street
Adelaide SA 5000

GPO Box 320
Adelaide SA 5001

Telephone: 08 8226 5500
Facsimile: 08 8226 5866

www.sa.gov.au/otr

1 September 2017

Robert Connell
AGL Energy Limited
Level 24, 200 George Street
Sydney NSW 2000
By email: RConnell@agl.com.au

Dear Robert,

RE: CERTIFICATE FOR DEVELOPMENT OF THE BARKER INLET POWER STATION

The development of the Barker Inlet Power Station has been assessed by the Office of the Technical Regulator (OTR) under Section 37 of the Development Act 1993.

Regulation 70 of the *Development Regulations 2008* prescribes if the proposed development is for the purposes of the provision of electricity generating plant with a generating capacity of more than 5 MW that is to be connected to the State's power system – a certificate from the Technical Regulator is required, certifying that the proposed development complies with the requirements of the Technical Regulator in relation to the security and stability of the State's power system.

In making a decision on your application, our office has taken the following information into account:

- AGL Energy's letter to the OTR dated 1 August 2017, emailed by yourself on 1 August 2017;
- Further supporting information to the application, emailed to the OTR by yourself on 14 August 2017;
- Numerous meetings between OTR and AGL representatives to discuss this application.

After assessing the information provided, the OTR noted that a shortfall in inertia/fast frequency response existed in AGL Energy's application. AGL Energy has put forth an alternative approach as to the requirements of fast frequency response, which is to be considered in further detail with the OTR.

Government of South Australia
Department of the Premier and Cabinet

As discussed in a meeting between the OTR and AGL Energy on 30 August 2017, I hereby advise that approval is granted for the proposed generator, on the provision that the outstanding issues of the application will be resolved to the satisfaction of the OTR in the near future.

Should you have any questions regarding this matter, please do not hesitate to call David Bosnakis on (08) 8226 5521.

Yours sincerely

Rob Faunt
TECHNICAL REGULATOR

cc: Bruce Bennett – AGL Energy
Chris Lim - DSD

Energy and Technical Regulations

Level 8, 11 Waymouth Street Adelaide SA 5000 | GPO Box 320 Adelaide SA 5001 | DX541
Tel (+61) 8 8226 5500 | Fax (+61) 8 8226 5866 | www.dpc.sa.gov.au | ABN 83 524 915 929

Appendix C

EPBC Act referral decision

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Australian Government

Department of the Environment, Water, Heritage and the Arts

Notification of REFERRAL DECISION – not controlled action

Torrens Island Energy Park, SA (EPBC 2010/5398)

This decision is made under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Proposed action

person named in the referral	Head of Lands and Approvals AGL Energy Limited
proposed action	To construct a gas storage facility and gas turbines, for the storage and production of liquefied natural gas, and associated infrastructure including an access road and an additional pipeline to transport gas to the new facilities, on Torrens Island, SA [see EPBC Act referral number 2010/5398)

Referral decision: Not a controlled action

status of proposed action	The proposed action is not a controlled action.

Person authorised to make decision

Name and position	Ms Vicki Middleton Assistant Secretary Environment Assessment Branch
signature	Vicki Middleton
date of decision	14 April 2010

Appendix D

Flora and fauna addendum & Flora and fauna main report

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Donato Environmental Services
ABN: 68083 254 015
Email: ddonato@rbe.net.au
Skype: daviddonato8941

Addendum

Addendum: Flora and fauna study: Torrens Island Energy Park

Report to:
Coffey
September 2017, V2

Disclaimer

This report has been prepared and produced by Donato Environmental Services (ABN 68083 254 015) in good faith. However, Donato Environmental Services accepts no liability (including liability of negligence) and takes no responsibility for any loss that a user of this report or any third party may suffer or incur as a result of reliance or use, as stated or inferred in this report, and in particular for:

- any errors, misinterpretations or omissions in the report;
- any inaccuracy in the information and data on which this report is based or contained in this report; and
- any interpretations, recommendations or opinions stated in, or which may be inferred from, this report.

Citation

Madden-Hallett, D. M., and Donato, D.B., (2017). Addendum Flora and fauna study: Torrens Island Energy Park V2. Donato Environmental Services, Darwin.

Distribution

Receivers	Copies	Date Issued	Contact name
Coffey	Version 1 (electronic)	4 September 2017	Jayne Rutter
DES	Comments	7 September 2017	D. Donato, D. Madden-Hallett
Coffey	Version 2 (electronic)	11 September 2017	Jayne Rutter

Executive Summary

Donato Environmental Services (DES) has been approached by Coffey to review the contemporary validity of the DES 2010 Flora and Fauna Study: Torrens Island Energy Park (hereafter referred to as the DES Report) [1]. This Addendum, to the DES Report, is to be read in the context of that report.

During the site visit (July 2017), it was recognised that the natural environment had not significantly changed since the previous site visits in 2009. Consequently the findings of the DES Report remain valid.

As expected, significant changes were identified in the updated natural history databases since 2009. This addendum details the results of renewed natural history database searches using the same methodology as used in the DES Report.

The current (July 2017) database searches revealed a total of 150 bird species, six mammal species and three marine reptile species that were not previously listed in the databases and consequently not reported in the DES Report. Under the *Environment Protection and Biodiversity* Act 1999 (EPBC Act), two species, both birds, are listed as Critically Endangered, six species as Endangered and 15 as Vulnerable. One threatened ecological community: Subtropical and Temperate Coastal Saltmarsh was revealed and is listed as Vulnerable under the EPBC Act.

Under the *National Parks and Wildlife* Act 1974 (NPW Act), 11 species are listed as Endangered, ten species as Vulnerable and 17 species as Rare.

The current (July 2017) flora database searches revealed a total of 40 plant taxa previously not listed in the databases and consequently not recorded in the DES Report. Of these species, two are listed under the EPBC Act, both orchids, one as Endangered, *Caladenia tensa* (Greencomb Spider-orchid) and one, *Prasophyllum validum* (Sturdy Leek-orchid) as Vulnerable. Two species are listed under the NPW Act, *Crassula exserta* (Large-fruit Crassula) is listed as Rare and an orchid, *Prasophyllum validum* (Sturdy Leek-orchid) as Vulnerable. Invasive taxa totalled 11 with nine taxa listed as Weeds of National Significance (WoNS) and all 11 declared under the *Natural Resource Management* Act 2004 (NRM Act) South Australia. An increase in the number of declared and/or WoNS species was recorded in this desktop survey in comparison to the previous DES 2009 report.

During the 2017 site visit, one threatened species, Adriana quadripartita (Rare Bitterbush) was recorded 120 m north by north east of the development footprint. One Vulnerable species, Slender-billed Thornbill *Acanthiza iredalei rosinae* was observed on the samphire community 350 m north east of the development envelope.

The findings of the July 2017 site visit and database searches have provided a contemporary and complete report. The risk assessment and consequently the conclusions as described in the DES Report remain valid and unchanged.

The Torrens Island Action Plan (TI Action Plan), published in 2013 [2], subsequent to the DES Report, provides management strategies to enhance the biodiversity of Torrens Island. When managing threats to biodiversity associated with the proposed development, consideration should be given to the Threats (management issues), Biodiversity management strategies and Monitoring as described in the TI action plan.

Introduction

Background

Donato Environmental Services (DES) has been approached by Coffey to review the contemporary validity of the report titled ""*de Vries, M.C. and Donato, D.B., (2009). Flora and fauna study: Torrens Island Energy Park, report to Coffey Natural Systems, January 2010, Donato Environmental Services, Darwin*", hereafter referred to as the DES Report [1]. The DES Report provided a baseline flora and fauna characterisation and an impact assessment of Project Bulla Energy Park (PBEP). Field flora and fauna assessments were conducted in August and September 2009. Natural history database searches were conducted from June to September 2009. It was intended that this work will be an appendix to the Environment and Social Impact Assessment process under Section 49, Division 3 of the Development Act 1993. For that work, the then Coffey Natural Systems, provided DES with a brief titled, "Flora and Fauna Study Brief: Project Bulla Energy Park, August 2009".

The purpose of this Addendum is to assess the contemporary validity of the DES Report and provide updates of information where necessary.

This Addendum is to be read in the context of the DES Report. The contents and information contained in the DES Report are assumed knowledge and not necessarily repeated here.

Project description

AGL is the owner and operator of (Torrens Island Power Station) TIPS which:

- was constructed between 1963 and 1981;
- was purchased by AGL in July 2007; and
- currently has a generating capacity of 1,280 MW split between two sections, TIPS A (4 × 120 MW) and TIPS B (4 × 200 MW).

TIPS A and TIPS B each have a bank of four boilers and steam turbines. The boilers are predominantly gas fired but can be fired on oil during interrupted gas supply.

Natural gas is supplied via the South-east Australia Gas (SEAGas) pipeline from Victoria and the Epic Energy Moomba to Adelaide pipeline (MAP).

AGL is investigating the feasibility of expanding its existing facilities at Torrens Island to develop a new power station (Barker Inlet Power Station) that will allow for progressive development of a series of energy-based projects. The proposed components of the power station are described as:

- a new power generation facility; and
- new (in part) access road.

The proposed development envelope has been amended and is provided in Figure 1. Two options of the layout are presented. Compared to the development design as provided in the DES Report, the LNG facility component has been deleted and the power plant has been moved. There is a new access road, labelled as eastern road option. This equates to a reduction in the size of the development envelope which is still predominately remaining within the original development envelope.

Technical designs of the proposed development were not provided.

Figure 1. Project development footprint

Methodolgy

The methodology to characterise the flora and fauna is provided in the DES Report.

Two methodologies were implemented in the Addendum to determine the contemporary validity of the DES Report: a site visit; and renewed natural history database searches.

David Donato, DES, visited the site on 25 July 2017. The site visit involved walking the new development envelope, including the new access road, documenting any additional plant and fauna species. The broader area, beyond the development envelope was viewed, including the wader roost habitat (see DES Report (Figure 1 and Appendix 14)).

Natural history databases searches were renewed, these follow the methodology provided in the DES Report (See DES Report, Appendix 1). It should be noted that considerable variations and additions have occurred to the previously searched databases since 2009.

Legislative listed species for the current (July 2017) desktop review follows that of the DES report, while regional conservation status has been derived from the latest assessment project for the Adelaide and Mount Lofty Ranges [3].

Results

Field site visit

The site visit did not identify any additional plant species that were not already known or likely to occur in the region.

An individual of *Adriana quadripartita* (Rare Bitterbush), listed as Threatened under the EPBC Act was recorded 120 m north by north east of the current development envelope (S34 48 03, E138 31 25 WGS 84)..

Slender-billed Thornbill *Acanthiza iredalei rosinae* was observed on the samphire community (saltmarsh) 350 m north east of the development envelope (S34 47 56 E138 31 28 WGS 84) and the record was subsequently lodged within Birdlife Birdata online. One individual was observed but up to four birds were heard. The species is listed as Vulnerable under both the EPBC Act and the NPW Act. It had once been previously recorded (2014) on Torrens Island, although frequently recorded at nearby St Kilda.

Ecological communities, within the proposed development footprint, are largely alternated, consisting of hard stand areas, exotic grasses and plantings of indigenous and non-indigenous tree species. Also within the development footprint are some areas of regenerating sand dune communities of poor integrity.

In the broader study area there are three main ecological communities: shoreline, samphire (salt marsh) and sand dune (see DES Report, Figure 9) (see DES Report Appendices 4 and 5 for species identified in each community). The extent and condition of these communities have not substantially changed since the August and September 2009 site visits, although they appear to have improved in integrity with the growing of plantings, natural regeneration and at times effective rabbit control. It was noted from observations that the extent of rabbit burrows, buck heaps and scratching was less extensive compared to the site visit in 2009. This also correlates with reasonably extensive natural regeneration of *Callistris gracilis* from plantings that have now reached maturity. This is likely due to effective rabbit control and reasonable rainfall.

The proposed route of the new eastern access road (Figure 1) traverses significantly altered ecological communities of hard stand areas and exotic grasses with some native plantings. In the vicinity of the proposed development footprint (western boundary) is a brackish wetland community almost uniformly dominated by *Ficinia nodosa* (see figure 2). This plant species does not provide a habitat for the Slender-billed Thornbill.

Figure 2. Knobby Club-grass (*Ficinia nodosa*) dominated brackish swamp at the vicinity of the western boundary of the development envelope.

Literature and Database searches

Literature

The report titled "*Torrens Island Biodiversity Action Plan, September 2013*", hereafter referred to as the TI Action Plan [2], is a significant and relevant work. The report was written subsequent to the DES Report. It contains relevant information with regard to management of biodiversity for Torrens Island. The TI action plan has been sighted and considered, but does not materially change the recommendations provided in the DES Report.

Adelaide and Mt Lofty Ranges Natural Resources Management Board : Shorebird Management and Conservation [4], has been sighted and considered. It provides relevance to the management of biodiversity, particularly shorebirds, in the region immediately contiguous to Torrens Island. This literature can be used as a guide in the management of shorebirds regarding the AGL proposed development.

Birdlife Australia runs an externally funded project titled the Samphire Coast Icon Project [5]. An aim is the conservation of nationally threatened samphire species and migratory shorebird habitats. It conducts annual monitoring of migratory waders in samphire (saltmarsh) habitats contiguous to Torrens Island.

Databases searches (July 2017): Fauna

The current fauna database searches revealed a total of 150 bird taxa, six mammal species and three marine reptile species previously unrecorded in the DES Report (see tables 1, 2 and Appendix A). The EPBC Act protected matters search revealed one threatened ecological community: *Subtropical and Temperate Coastal Saltmarsh*, listed as Vulnerable in August 2013, which exists to within 160 m north east of the development footprint.

Under the EPBC ACT two species, Northern Siberian Bar-tailed Godwit (*Limosa lapponica menzbieri*) and Plains-wanderer (*Pedionomus torquatus*), are listed as Critically Endangered, six species as Endangered and 15 as Vulnerable (see tables 2, 3 and Appendix A). Under the EPBC Act 35 species are listed under various international treaties, 34 species listed as migratory (marine, terrestrial and/or wetland) (see Table 2 and Appendix A).

Under the NPW Act 11 species are listed as Endangered, ten species as Vulnerable and 17 species as rare (see tables 2, 3 and Appendix A). Also 75 species recorded have non-legislative interim regional conservation ratings for the Adelaide Mount Lofty Region (AMLR) [3] (see Table 3 and Appendix A).

Under the EPBC Act, one mammal, the Grey-headed Flying Fox, *Pteropus poliocephalus* is listed as Vulnerable and Rare under the NPW Act and a conservation rating of rare regionally with a likelihood of occurrence.

Invasive avian species totalled nine with seven declared under *the Natural Resource Management* Act 2004 (NRM Act) of South Australia.

Table 1. Invasive mammal species recorded in the present desktop survey not previously recorded and their conservation status (EPBC ACT = N and NPW Act = S in DES 2009 Report). Likeliness of occurrence refers species or species habitat likely to occur. This table is the equivalent to Table 7 in the DES 2009 report.

Scientific name	Common name	NRM Act	Likelihood of occurance
Lepus capensis	Brown hare		X
Bos Taurus	Domestic cattle	Declared	X
Canis lupus familiaris	Domestic dog	Declared	X
Capra hircus	Goat	Declared in parts	X
Sus scofa	Pig	Declared	X

Table 2. Reptile species recorded in the present desktop survey not previously recorded and their conservation status (EPBC ACT = N and NPW Act = S in DES 2009 Report). Likeliness of occurrence refers to foraging, feeding or related behaviour. This table is the equivalent to Table 6 in the DES 2009 report.

Species name	Common name	EPBC Act	NPW Act	Likelihood of occurrence
Caretta caretta	Loggerhead Turtle	Endangered	Endangered	X
Chelonia mydas	Green Turtle	Vulnerable	Vulnerable	X
Dermochelys coriacea	Leatherback Turtle	Endangered	Vulnerable	X

Table 3. Listed bird species recorded in the current desktop not previously recorded (EPBC ACT = N and NPW Act = S, AMLR = R in DES 2009 Report; M = Migratory; Mw = Migratory Wetlands; Mm = Migratory marine; Mt = Migratory Terrestrial; Treaty = International treaties, Bonn, CAMBA, JAMBA, ROKAMBA). This table is the equivalent to Table 8 in the DES 2009 report.

Common Name	*Scientific Name*	NPW Act	AMLR	NRM Act	EPBC Act	EPBC Act Protected matters	EPBC Act Likelihood of occurrence
Pink-eared Duck	*Malacorhynchus membranaceus*		Rare				
Cape Barren Goose	*Cereopsis novaehollandiae*	Rare	Rare				
Freckled Duck	*Stictonetta naevosa*	Rare	Vulnerable				
Stubble Quail	*Coturnix pectoralis*		Near threatened				
Australasian Grebe	*Tachybaptus novaehollandiae*		Least concern				
Great Crested Grebe	*Podiceps cristatus*	Rare	Vulnerable				
Peaceful Dove	*Geopelia placida*		Vulnerable				
Black-eared Cuckoo	*Chalcites osculans*		Endangered				
Fan-tailed Cuckoo	*Cacomantis flabelliformis*		Near threatened				
Tawny Frogmouth	*Podargus strigoides*		Near threatened				
Fork-tailed Swift	*Apus pacificus*		Rare				
Lewin's Rail	*Lewinia pectoralis*	Vulnerable	Endangered				
Banded Rail	*Gallirallus philippensis*		Rare				
Australian Spotted Crake	*Porzana fluminea*		Rare				
Grey Plover	*Pluvialis squatarola*					Treaty	Roosting known
Double-banded Plover	*Charadrius bicinctus*		Critically endangered			M; Mw; Treaty	Roosting known
Ruddy Turnstone	*Arenaria interpres*	Rare	Endangered			M; Mw; Treaty	Roosting known
Long-toed Stint	*Calidris subminuta*	Rare				Mm; Mw	Roosting known

Common Name	*Scientific Name*	NPW Act	AMLR	NRM Act	EPBC Act	EPBC Act Protected matters	EPBC Act Likelihood of occurrence
Sanderling	*Calidris alba*	Rare				M; Mw; Treaty	Roosting known
Pectoral Sandpiper	*Calidris melanotos*	Rare	Rare			M; Mw; Treaty	
Sharp-tailed Sandpiper	*Calidris acuminata*		Vulnerable			M; Mw; Treaty	Roosting known
Little whimbrel	*Numenius minutus*					M; Mw; Treaty	
Ruff	*Philomachus pugnax*	Rare				M; Mw; Treaty	Roosting known
Siberian (Grey-tailed) Tattler	*Tringa brevipes*		Critically endangered			M; Mw; Treaty	Roosting known
Red-necked Phalarope	*Phalaropus lobatus*					M; Mw; Treaty	Roosting known
Little Button-quail	*Turnix velox*		Vulnerable				
Australian Pratincole	*Stiltia isabella*		Rare				
Antarctic Tern	*Sterna vittata*				Vulnerable		
Australasian Bittern	*Botaurus poiciloptilus*	Vulnerable	Critically endangered		Endangered		Species or species habitat known
Intermediate Egret	*Ardea intermedia*	Rare					
White-necked Heron	*Ardea pacifica*		Vulnerable				
Eastern Reef Egret	*Egretta sacra*		Critically endangered				
Pallid Cuckoo	*Cacomantis pallidus*		Rare				
Osprey	*Pandion haliaetus*	Endangered	Vulnerable			M; Mw; Treaty	Species or species habitat likely
Square-tailed Kite	*Lophoictinia isura*	Endangered	Critically endangered				
Wedge-tailed Eagle	*Aquila audax*		Least concern		Endangered		

Common Name	*Scientific Name*	NPW Act	AMLR	NRM Act	EPBC Act	EPBC Act Protected matters	EPBC Act Likelihood of occurrence
Spotted Harrier	*Circus assimilis*		Vulnerable				
Black Kite	*Milvus migrans*		Rare				
Southern Boobook	*Ninox novaeseelandiae*		Near threatened				
Laughing Kookaburra	*Dacelo novaeguineae*		Least concern				
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	Vulnerable	Vulnerable				
Little Corella*	*Cacatua sanguinea*		Least concern				
Regent Parrot	*Polytelis anthopeplus*	Vulnerable					
Red-rumped Parrot	*Psephotus haematonotus*		Near threatened				
Eastern Rosella	*Platycercus eximius*		Least concern				
Australian Ringneck	*Barnardius zonarius*		Rare				
Blue-winged Parrot	*Neophema chrysostoma*	Vulnerable	Vulnerable				
Little Lorikeet	*Glossopsitta pusilla*	Endangered	Critically Endangered				
Variegated Fairy-wren	*Malurus lamberti*		Rare				
Black-chinned Honeyeater	*Melithreptus gularis*		Critically Endangered				
White-naped Honeyeater	*Melithreptus lunatus*		Vulnerable				
Eastern Spinebill	*Acanthorhynchus tenuirostris*		Least concern				
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*		Near threatened				
Yellow-throated Miner	*Manorina flavigula*		Endangered				
Spotted Pardalote	*Pardalotus punctatus*		Near threatened				

Common Name	*Scientific Name*	NPW Act	AMLR	NRM Act	EPBC Act	EPBC Act Protected matters	EPBC Act Likelihood of occurrence
Weebill	*Smicrornis brevirostris*		Least concern				
Southern Whiteface	*Aphelocephala leucopsis*		Endangered				
Yellow Thornbill	*Acanthiza nana*		Near threatened				
Striated Thornbill	*Acanthiza lineata*		Least concern				
Slender-billed Thornbill	*Acanthiza iredalei*	Vulnerable	Vulnerable		Vulnerable		Species or species habitat likely
Chestnut-rumped Thornbill	*Acanthiza uropygialis*		Vulnerable				
Buff-rumped Thornbill	*Acanthiza reguloides*		Near threatened				
White-browed Babbler	*Pomatostomus superciliosus*		Endangered				
Masked Woodswallow	*Artamus personatus*		Rare				
Restless Flycatcher	*Myiagra inquieta*	Rare	Critically Endangered				
Magpie-lark	*Grallina cyanoleuca*		Least concern				
Welcome Swallow	*Hirundo neoxena*		Least concern				
Rose Robin	*Petroica rosea*		Rare				
Flame Robin	*Petroica phoenicea*	Vulnerable	Critically Endangered				
Red-capped Robin	*Petroica goodenovii*		Rare				
Mistletoebird	*Dicaeum hirundinaceum*		Least concern				
Diamond Firetail	*Stagonopleura guttata*	Vulnerable	Endangered				
Red-browed Finch	*Neochmia temporalis*		Near threatened				
Zebra Finch	*Taeniopygia guttata*		Vulnerable				

Common Name	*Scientific Name*	NPW Act	AMLR	NRM Act	EPBC Act	EPBC Act Protected matters	EPBC Act Likelihood of occurrence
Horsfield's Bushlark	*Mirafra javanica*		Vulnerable				
Fairy Martin	*Petrochelidon ariel*		Rare				
Greater Sand Plover, Large Sand Plover	*Charadrius leschenaultii*	Rare	Rare		Vulnerable	M; Mw; Treaty	Roosting known
Antipodean Albatross	*Diomedea antipodensis*				Vulnerable	Treaty	Foraging, feeding or related behaviour likely
Southern Royal Albatross	*Diomedea epomophora*	Vulnerable			Vulnerable	Mm; treaty	Foraging, feeding or related behaviour likely
Wandering Albatross	*Diomedea exulans*	Vulnerable			Vulnerable	Mm; treaty	Foraging, feeding or related behaviour likely
Northern Royal Albatross	*Diomedea sanfordi*	Endangered			Endangered	M; treaty	Foraging, feeding or related behaviour likely
Painted Honeyeater	*Grantiella picta*	Rare			Vulnerable		Species or species habitat may
Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit	*Limosa lapponica baueri*				Vulnerable	Mm; Mw; Treaty	Species or species habitat may
Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit	*Limosa lapponica menzbieri*				Critically Endangered	Mm; Treaty	Species or species habitat may
Fairy Prion (southern)	*Pachyptila turtur subantarctica*				Vulnerable	Treaty	Species or species habitat known
Plains-wanderer	*Pedionomus torquatus*	Endangered	Regionally extinct		Critically Endangered		Species or species habitat may
Night Parrot	*Pezoporus occidentalis*	Endangered			Endangered		Extinct within area
Sooty Albatross	*Phoebetria fusca*	Endangered			Vulnerable	M	Species or species habitat may

Common Name	*Scientific Name*	NPW Act	AMLR	NRM Act	EPBC Act	EPBC Act Protected matters	EPBC Act Likelihood of occurrence
Fairy Tern	*Sternula nereis nereis*	Endangered	Critically Endangered		Vulnerable		Breeding likely to occur within area
White-capped Albatross	*Thalassarche cauta steadi*				Vulnerable		Foraging, feeding or related behaviour likely
Campbell Albatross, Campbell Black-browed Albatross	*Thalassarche impavida*				Vulnerable		Species or species habitat may
Flesh-footed Shearwater	*Ardenna carneipes*					Mm; Treaty	Foraging, feeding or related behaviour likely
Sooty Albatross	*Phoebetria fusca*	Endangered			Vulnerable	Mm; treaty	Species or species habitat may
Little Tern	*Sternula albifrons*	Endangered				Mm; treaty	Species or species habitat may
Common Sandpiper	*Actitis hypoleucos*	Rare	Endangered			M; Mw; Treaty	Species or species habitat known
Oriental Plover (Dotterel)	*Charadrius veredus*					M; Mw; Treaty	Roosting known
Swinhoe's Snipe	*Gallinago megala*					M; Mw; Treaty	Roosting likely to occur within area
Pin-tailed Snipe	*Gallinago stenura*					M; Mw; Treaty	Roosting likely to occur within area
Broad-billed Sandpiper	*Limicola falcinellus*					M; Mw; Treaty	Roosting likely to occur wihtng area
Black-tailed Godwit	*Limosa limosa*	Rare				M; Mw; Treaty	Roosting known to occur within area
Pacific Golden Plover	*Pluvialis fulva*	Rare	Critically Endangered			M; Mw; Treaty	Roosting known
Wood Sandpiper	*Tringa glareola*	Rare	Endangered			M; Mw; Treaty	Species or species habitat known

Common Name	*Scientific Name*	NPW Act	AMLR	NRM Act	EPBC Act	EPBC Act Protected matters	EPBC Act Likelihood of occurrence
Common Greenshank, Greenshank	*Tringa nebularia*		Vulnerable			M; Mw; Treaty	Roosting known
Terek Sandpiper	*Xenus cinereus*	Rare	Rare			M; Mw; Treaty	Roosting likely to occur within area
Grey Wagtail	*Motacilla cinerea*					Mt; Treaty	Species or species habitat may
Yellow Wagtail	*Motacilla flava*					Mt; Treaty	Species or species habitat may
Satin Flycatcher	*Myiagra cyanoleuca*	Endangered				Mt; Treaty	Species or species habitat may
Invasive species							
Common Myna	*Acridotheres tristis*						Species or species habitat likely
Skylark	*Alauda arvensis*			Declared			Species or species habitat likely
Mallard	*Anas platyrhynchos*			Declared			Species or species habitat likely
Rock Pigeon	*Columba livia*			Declared			Species or species habitat likely
Red-whiskered Bulbul	*Pycnonotus jocosus*						Species or species habitat likely
Spotted Turtle-dove	*Streptopelia chinensis*			Declared			Species or species habitat likely
House Sparrow	*Passer domesticus*			Declared			Species or species habitat likely
Domestic Duck	*Anas sp.*			Declared			
Domestic Goose	*Anser sp.*			Declared			

Flora

Flora database searches combined revealed a total of 40 plant taxa unrecorded in the previous desktop survey (Appendix B). Under the EPBC Act two species are listed, both orchids, one as Endangered, *Caladenia tensa* (Greencomb Spider-orchid) and one, *Prasophyllum validum* (Sturdy Leek-orchid) as Vulnerable (Table 4). Under the NPW Act, two species are listed, *Crassula exserta* (Large-fruit Crassula) as Rare and an orchid, *Prasophyllum validum* (Sturdy Leek-orchid) as Vulnerable (Table 4). For the Adelaide and Mount Lofty Region (AMLR) [3], 13 species recorded have non-legislative interim regional conservation ratings five species are vulnerable, three species are rare, three near threatened and three least concern (Table 4).

Invasive taxa totalled 11 with nine taxa listed as Weeds of National Significance (WoNS) and all 11 declared under the *Natural Resource Management* Act 2004 (NRM Act) South Australia (Table 5).

Table 4. Listed flora species recorded in the current desktop not previously recorded (EPBC ACT = N and NPW Act = S, AMLR (Adelaide and Mount Lofty Region) = R in DES 2009 Report). This table is the equivalent to Table 3 in the DES 2009 report.

Scientific Name	Common Name	NPW Act	EPBC Act	AMLR	Occurrence on Torrens Island
CYPERACEAE					
Bolboschoenus caldwellii	Salt Club-rush			Rare	X
Gahnia filum	Thatching Grass			Vulnerable	X
AIZOACEAE					
Carpobrotus rossii	Native Pigface			Least concern	X
CRASSULACEAE					
Crassula exserta	Large-fruit Crassula	Rare		Rare	X
LILIACEAE					
Dianella brevicaulis	Short-stem Flax-lily			Near Threatened	X
MYRTACEAE					
Eucalyptus leucoxylon ssp. *leucoxylon*	South Australian Blue Gum			Near Threatened	X
ZANNICHELLIACEAE					
Lepilaena cylindrocarpa	Long-fruit Water-mat			Vulnerable	X
EPACRIDACEAE					
Leucopogon parviflorus	Coast Beard-heath			Near Threatened	X
CHENOPODIACEAE					
Enchylaena tomentosa var. *tomentosa*	Ruby Saltbush			Least concern	X
Rhagodia candolleana ssp. *candolleana*	Sea-berry Saltbush			Least concern	X
Tecticornia arbuscula	Shrubby Samphire			Vulnerable	X
Tecticornia pergranulata ssp. *pergranulata*	Black-seed Samphire			Vulnerable	X

Scientific Name	Common Name	NPW Act	EPBC Act	AMLR	Occurrence on Torrens Island
CONVOLVULACEAE					
Wilsonia rotundifolia	Round-leaf Wilsonia			Vulnerable	X
ORCHIDACEAE					
Caladenia tensa	Greencomb Spider-orchid, Rigid Spider Orchid		Endangered	Rare	
Prasophyllum validum	Sturdy Leek-orchid	Vulnerable	Vulnerable		

Table 5. Invasive flora taxa recorded in the current desktop not previously recorded (EPBC ACT = N and NRM Act = S in DES 2009 Report). This table is the equivalent to Table 4 in the DES 2009 report.

Scientific name	Common name	NRM Act	WoNS
Opuntia stricta	Erect Prickly Pear	Declared	WoNS
Chrysanthemoides monilifera	Bitou Bush, Boneseed	Declared	
Chrysanthemoides monilifera ssp. *monilifera*	Boneseed	Declared	WoNS
Genista linifolia	Flax-leaved Broom, Mediterranean Broom, Flax Broom	Declared	
Lantana camara	Lantana, Wild Sage	Declared	WoNS
Nassella neesiana	Chilean Needle grass	Declared	WoNS
Rubus fruticosus aggregate	Blackberry, European Blackberry	Declared	WoNS
Salix spp.	Willows	Declared	WoNS
Solanum elaeagnifolium	Silver Nightshade	Declared	WoNS
Tamarix aphylla	Athel Pine	Declared	WoNS
Ulex europaeus	Gorse, Furze	Declared	WoNS

Discussion

The DES Report remains contemporarily valid with addition of this Addendum.

The ecological communities within the development envelope as described in the DES Reports Figure 9 and appendices 4 and 5 remain valid; are largely altered consisting of hard stand areas, exotic grasses and plantings of indigenous and non indigenous tree species.

The extent and condition of these communities have not substantially changed since the August and September 2009 site visits, despite some natural regeneration from maturing plantings.

One ecological community has been declared under the EPBC Act since the writing of the 2009 DES report: *Subtropical and Temperate Coastal Saltmarsh*, listed as Vulnerable in August 2013, and is outside the development footprint.

The increase in the number of taxa recorded from database searches from the previous desktop survey is a function of increases in the number of surveys, more comprehensive databases and better search techniques of those databases. Of particular note is the increase in the number of bird taxa recorded. This is reflective of local projects [6] focusing more on shorebird and migratory bird counts.

Two critically endangered species were recorded during the current desktop survey, Northern Siberian Bar-tailed Godwit (*Limosa lapponica menzbieri*) and Plains-wanderer (*Pedionomus torquatus*). The current EPBC Act protected matters returned a result of 'species or species habitat may occur within the area' for both of these species. It is noted that no other records for these species occurred during the current desktop survey and in the case of the Plains-wanderer, this species has been attributed the rating of 'regionally extinct' within the Adelaide and Mount Lofty Region [3]. These species have not been cited on Torrens Island and their presence is unlikely.

Slender-billed Thornbill Acanthiza iredalei rosinae was recorded as 'species or species habitat likely to occur within the area' from the EPBC Act protected matters search and was recorded in all other database searches. This species was observed during the DES 2017 site visit on the samphire community (described as Subtropical and Temperate Coastal Saltmarsh under the EPBC Act), 350 m north east of the development envelope. One individual was observed, calling from the top of a samphire, while up to three others were heard calling from within the same habitat nearby. The species is likely to be resident in this habitat on Torrens Island. This Slender-billed Thornbill subspecies is a habitat specialist, inhabiting coastal South Australia, fringing Gulf St Vincent, primarily in samphire on saline coastal flats often within tidal channels [7]. This habitat does not exist within the development footprint, and it is not plausible that the species will inhabit the non saline highly modified habitats within the development footprint. The listed avian taxa recorded as occurring or likely/may occur on Torrens Island are mainly shorebirds and marine species. The habitats for these species are outside the development footprint.
The listed avian taxa recorded as occurring or likely/may occur on Torrens Island are mainly shorebirds and marine species. The habitats for these species are outside the development footprint.

The Australasian Bittern was listed (see Table 3), as species or species habitat known under the EPBC Act. Its' habitat is described as tall, dense vegetation of reeds (Phragmites), sedges, rushes (Scirpus, Juncus, Eleocharis) and cat tails (Typha) along margins of rivers, pools, lakes and swamps, and rice paddies, predominately freshwater but at times also found in brackish water, but it avoids coasts [8]. These habitats are not present on Torrens Island and the occurrence of the species on the island is not plausible.

The Grey-headed Flying Fox is listed as Vulnerable under the EPBC Act and Rare under the NPW Act. The record for this desktop review is from the EPBC Act Protected matters search. The extent of occurrence for this species does include Torrens Island and the likelihood of occurrence within the EPBC protected matters report states that foraging or feeding or related behaviour is likely to occur within the area. However, no actual record for this species has been located from other databases. No habitat for this species exists on Torrens Island and it is suspected that the habitat would be more suitable west and east of adjacent land to Torrens Island.

There is no suitable feeding or nesting habitat on Torrens Island for the marine species of turtles recorded in the desktop survey.

During the 2017 site visit, one threatened flora species, *Adriana quadripartita* (Rare Bitterbush) was recorded 120 m north by north east of the development footprint.

The timing of the field survey (July2017) is unsuitable to conclusively establish whether the two Orchid species, *Caladenia tensa* and *Prasophyllum validum*, recorded from the EPBC Act protected matters search as present on Torrens Island. Surveys for both of these species are best conducted from September to October for *C. tensa* and October to November for *P. validum*. However, it is unlikely that either of these species are present on the island due to lack of suitable habitat.

The rare, as listed under the NPW Act, Large-fruit Crassula (*Crassula exserta*), was last recorded in 1988 on the adjacent land west of Torrens Island in Osborne. The species is a succulent annual herb growing on sandy and clayey soils on Granite outcrops, swamps, depressions and saline mud flats. The species may occur on Torrens Island.

It should be noted that there is an increase in the number of declared and /or WoNs species recorded in this desktop survey in comparison to the previous DES Report.

The findings of the July 2017 site visit and database searches have provided a more contemporary and complete report, however they do not change the findings of the risk assessment as provided in the DES Report.

The TI Action Plan provides management strategies to enhance the biodiversity of Torrens Island. When managing threats to biodiversity associated with the proposed development, consideration should be given to the Threats (management issues), Biodiversity management strategies and Monitoring as described in the TI Action Plan.

Recommendations

The risk assessment and consequently the recommendations as described in the DES Report remain valid and unchanged.

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Appendix A:

Avain Taxa recorded during the current desktop survey not recorded in the DES 2009 report

Appendix A

DES
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ENVIRONMENTAL SERVICES

Appendix A

Table 1. Avain Taxa recorded during the current desktop survey not recorded in the DES 2009 report (EPBC ACT = N, NPW Act = S, AMLR = R, NRM Act = S in DES 2009 Report) This table is the equivelent to Appendices 4 (Native flora) and 5 (Invasive) in the DES 2009 report.

Common Name	*Scientific Name*	NPW Act	AMLR	NRM Act	EPBC Act	EPBC Act Protected matters	EPBC Act Likelihood of occurrence
Pink-eared Duck	*Malacorhynchus membranaceus*		Rare				
Cape Barren Goose	*Cereopsis novaehollandiae*	Rare	Rare				
Freckled Duck	*Stictonetta naevosa*	Rare	Vulnerable				
Stubble Quail	*Coturnix pectoralis*		Near threatened				
Australasian Grebe	*Tachybaptus novaehollandiae*		Least concern				
Great Crested Grebe	*Podiceps cristatus*	Rare	Vulnerable				
Barbary Dove	*Streptopelia roseogrisea*						
Diamond Dove	*Geopelia cuneata*						
Peaceful Dove	*Geopelia placida*		Vulnerable				
Black-eared Cuckoo	*Chalcites osculans*		Endangered				
Fan-tailed Cuckoo	*Cacomantis flabelliformis*		Near threatened				
Tawny Frogmouth	*Podargus strigoides*		Near threatened				
Fork-tailed Swift	*Apus pacificus*		Rare				
Lewin's Rail	*Lewinia pectoralis*	Vulnerable	Endangered				
Banded Rail	*Gallirallus philippensis*		Rare				
Australian Spotted Crake	*Porzana fluminea*		Rare				
Grey Plover	*Pluvialis squatarola*					Treaty	Roosting known
Double-banded Plover	*Charadrius bicinctus*		Critically Endangered			M; Mw; Treaty	Roosting known

Appendix A

Common Name	*Scientific Name*	NPW Act	AMLR	NRM Act	EPBC Act	EPBC Act Protected matters	EPBC Act Likelihood of occurrence
Hudsonian Godwit	*Limosa haemastica*						
Inland Dotterel	*Charadrius australis*						
Ruddy Turnstone	*Arenaria interpres*	Rare	Endangered			M; Mw; Treaty	Roosting known
Long-toed Stint	*Calidris subminuta*	Rare				Mm; Mw	Roosting known
Sanderling	*Calidris alba*	Rare				M; Mw; Treaty	Roosting known
Little Stint	*Calidris minuta*						
Pectoral Sandpiper	*Calidris melanotos*	Rare	Rare			M; Mw; Treaty	
Sharp-tailed Sandpiper	*Calidris acuminata*		Vulnerable			M; Mw; Treaty	Roosting known
Little whimbrel	*Numenius minutus*					M; Mw; Treaty	
Ruff	*Philomachus pugnax*	Rare				M; Mw; Treaty	Roosting known
Siberian (Grey-tailed) Tattler	*Tringa brevipes*		Critically endangered			M; Mw; Treaty	Roosting known
Lesser Yellowlegs	*Tringa flavipes*						
Red-necked Phalarope	*Phalaropus lobatus*					M; Mw; Treaty	Roosting known
Little Button-quail	*Turnix velox*		Vulnerable				
Australian Pratincole	*Stiltia isabella*		Rare				
Australian Gull-billed Tern	*Gelochelidon macrotarsa*						
White-winged Black Tern	*Chlidonias leucopterus*						
White-fronted Tern	*Sterna striata*						
Arctic Tern	*Sterna paradisaea*						
Antarctic Tern	*Sterna vittata*				Vulnerable		

Appendix A

Common Name	*Scientific Name*	NPW Act	AMLR	NRM Act	EPBC Act	EPBC Act Protected matters	EPBC Act Likelihood of occurrence
Australasian gannet	*Morus serrator*						
Little Pied Cormorant	*Phalacrocorax melanoleucos*						
Australasian Bittern	Botaurus poiciloptilus	Vulnerable	Critaclly endangered		Endangered		Species or species habitat known
Australian Little Bittern	*Ixobrychus dubius*						
Intermediate Egret	*Ardea intermedia*	Rare					
Straw-necked Ibis	*Threskiornis spinicollis*						
White Ibis	*Threskiornis molucca*						
Straw-necked ibis	*Threskiornis spinicollis*						
White-necked Heron	*Ardea pacifica*		Vulnerable				
Eastern Reef Egret	*Egretta sacra*		Critically endangered				
Pallid Cuckoo	*Cacomantis pallidus*		Rare				
Osprey	*Pandion haliaetus*	Endangered	Vulnerable			M; Mw; Treaty	Species or species habitat likely
Square-tailed Kite	*Lophoictinia isura*	Endangered	Critically endangered				
Wedge-tailed Eagle	*Aquila audax*		Least concern		Endangered		
Spotted Harrier	*Circus assimilis*		Vulnerable				
Black Kite	*Milvus migrans*		Rare				
Barn Owl	*Tyto alba*						
Southern Boobook	*Ninox novaeseelandiae*		Near threatened				
Laughing Kookaburra	*Dacelo novaeguineae*		Least concern				
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	Vulnerable	Vulnerable				

Appendix A

Common Name	*Scientific Name*	NPW Act	AMLR	NRM Act	EPBC Act	EPBC Act Protected matters	EPBC Act Likelihood of occurrence
Long-billed Corella	*Cacatua tenuirostris*						
Little Corella*	*Cacatua sanguinea*		Least concern				
Regent Parrot	*Polytelis anthopeplus*	Vulnerable					
Red-rumped Parrot	*Psephotus haematonotus*		Near threatened				
Eastern Rosella	*Platycercus eximius*		Least concern				
Australian Ringneck	*Barnardius zonarius*		Rare				
Blue-winged Parrot	*Neophema chrysostoma*	Vulnerable	Vulnerable				
Little Lorikeet	*Glossopsitta pusilla*	Endangered	Critically Endangered				
Variegated Fairy-wren	*Malurus lamberti*		Rare				
Black-chinned Honeyeater	*Melithreptus gularis*		Critically Endangered				
White-naped Honeyeater	*Melithreptus lunatus*		Vulnerable				
Eastern Spinebill	*Acanthorhynchus tenuirostris*		Least concern				
Orange Chat	*Epthianura aurifrons*						
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*		Near threatened				
Yellow-plumed Honeyeater	*Lichenostomus ornatus*						
Noisy Miner	*Manorina melanocephala*						
Yellow-throated Miner	*Manorina flavigula*		Endangered				
Spotted Pardalote	*Pardalotus punctatus*		Near threatened				
Weebill	*Smicrornis brevirostris*		Least concern				
Southern Whiteface	*Aphelocephala leucopsis*		Endangered				

Appendix A

Common Name	*Scientific Name*	NPW Act	AMLR	NRM Act	EPBC Act	EPBC Act Protected matters	EPBC Act Likelihood of occurrence
Yellow Thornbill	*Acanthiza nana*		Near threatened				
Striated Thornbill	*Acanthiza lineata*		Least concern				
Slender-billed Thornbill	*Acanthiza iredalei*	Vulnerable	Vulnerable		Vulnerable		Species or species habitat likely
Chestnut-rumped Thornbill	*Acanthiza uropygialis*		Vulnerable				
Buff-rumped Thornbill	*Acanthiza reguloides*		Near threatened				
White-browed Babbler	*Pomatostomus superciliosus*		Endangered				
Pied Butcherbird	*Cracticus nigrogularis*						
Masked Woodswallow	*Artamus personatus*		Rare				
Black-faced Woodswallow	*Artamus cinereus*						
Restless Flycatcher	*Myiagra inquieta*	Rare	Critically Endangered				
Magpie-lark	*Grallina cyanoleuca*		Least concern				
Welcome Swallow	*Hirundo neoxena*		Least concern				
Little Crow*	*Corvus bennetti*						
Rose Robin	*Petroica rosea*		Rare				
Flame Robin	*Petroica phoenicea*	Vulnerable	Critically Endangered				
Red-capped Robin	*Petroica goodenovii*		Rare				
Mistletoebird	*Dicaeum hirundinaceum*		Least concern				
Diamond Firetail	*Stagonopleura guttata*	Vulnerable	Endangered				
Red-browed Finch	*Neochmia temporalis*		Near threatened				
Zebra Finch	*Taeniopygia guttata*		Vulnerable				

Appendix A

Common Name	*Scientific Name*	NPW Act	AMLR	NRM Act	EPBC Act	EPBC Act Protected matters	EPBC Act Likelihood of occurrence
Horsfield's Bushlark	*Mirafra javanica*		Vulnerable				
Fairy Martin	*Petrochelidon ariel*		Rare				
Muscovy Duck	*Cairina moschata*						
Ring-necked Parakeet	*Psittacula krameri*						
Greater Sand Plover, Large Sand Plover	*Charadrius leschenaultii*	Rare	Rare		Vulnerable	M; Mw; Treaty	Roosting known
Antipodean Albatross	*Diomedea antipodensis*				Vulnerable	Treaty	Foraging, feeding or related behaviour likely
Southern Royal Albatross	*Diomedea epomophora*	Vulnerable			Vulnerable	Mm; treaty	Foraging, feeding or related behaviour likely
Wandering Albatross	*Diomedea exulans*	Vulnerable			Vulnerable	Mm; treaty	Foraging, feeding or related behaviour likely
Northern Royal Albatross	*Diomedea sanfordi*	Endangered			Endangered	M; treaty	Foraging, feeding or related behaviour likely
Painted Honeyeater	*Grantiella picta*	Rare			Vulnerable		Species or species habitat may
Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit	*Limosa lapponica baueri*				Vulnerable	Mm; Mw; Treaty	Species or species habitat may
Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit	*Limosa lapponica menzbieri*				Critically Endangered	Mm; Treaty	Species or species habitat may
Fairy Prion (southern)	*Pachyptila turtur subantarctica*				Vulnerable	Treaty	Species or species habitat known
Plains-wanderer	*Pedionomus torquatus*	Endangered	Regionally Extinct		Critically Endangered		Species or species habitat may
Night Parrot	*Pezoporus occidentalis*	Endangered			Endangered		Extinct within area

Appendix A

Common Name	*Scientific Name*	NPW Act	AMLR	NRM Act	EPBC Act	EPBC Act Protected matters	EPBC Act Likelihood of occurrence
Sooty Albatross	*Phoebetria fusca*	Endangered			Vulnerable	M	Species or species habitat may
Fairy Tern	*Sternula nereis nereis*	Endangered	Critically Endangered		Vulnerable		Breeding likely to occur within area
White-capped Albatross	*Thalassarche cauta steadi*				Vulnerable		Foraging, feeding or related behaviour likely
Campbell Albatross, Campbell Black-browed Albatross	*Thalassarche impavida*				Vulnerable		Species or species habitat may
Flesh-footed Shearwater	*Ardenna carneipes*					Mm; Treaty	Foraging, feeding or related behaviour likely
Sooty Albatross	*Phoebetria fusca*	Endangered			Vulnerable	Mm; treaty	Species or species habitat may
Little Tern	*Sternula albifrons*	Endangered				Mm; treaty	Species or species habitat may
Common Sandpiper	*Actitis hypoleucos*	Rare	Endangered			M; Mw; Treaty	Species or species habitat known
Oriental Plover (Dotterel)	*Charadrius veredus*					M; Mw; Treaty	Roosting known
Swinhoe's Snipe	*Gallinago megala*					M; Mw; Treaty	Roosting likely to occur within area
Pin-tailed Snipe	*Gallinago stenura*					M; Mw; Treaty	Roosting likely to occur within area
Broad-billed Sandpiper	*Limicola falcinellus*					M; Mw; Treaty	Roosting likely to occur wihtng area
Black-tailed Godwit	*Limosa limosa*	Rare				M; Mw; Treaty	Roosting known to occur within area
Pacific Golden Plover	*Pluvialis fulva*	Rare	Critically Endangered			M; Mw; Treaty	Roosting known
Wood Sandpiper	*Tringa glareola*	Rare	Endangered			M; Mw; Treaty	Species or species habitat known

Appendix A

Common Name	*Scientific Name*	NPW Act	AMLR	NRM Act	EPBC Act	EPBC Act Protected matters	EPBC Act Likelihood of occurrence
Common Greenshank, Greenshank	*Tringa nebularia*		Vulnerable			M; Mw; Treaty	Roosting known
Terek Sandpiper	*Xenus cinereus*	Rare	Rare			M; Mw; Treaty	Roosting likely to occur within area
Grey Wagtail	*Motacilla cinerea*					Mt; Treaty	Species or species habitat may
Yellow Wagtail	*Motacilla flava*					Mt; Treaty	Species or species habitat may
Satin Flycatcher	*Myiagra cyanoleuca*	Endangered				Mt; Treaty	Species or species habitat may
Black Duck-Mallard hybrid							
Crow & Raven spp							
Large wader spp							
Medium wader spp							
Invasive species							
Common Myna	*Acridotheres tristis*						Species or species habitat likely
Skylark	*Alauda arvensis*			Declared			Species or species habitat likely
Mallard	*Anas platyrhynchos*			Declared			Species or species habitat likely
Rock Pigeon	*Columba livia*			Declared			Species or species habitat likely
Red-whiskered Bulbul	*Pycnonotus jocosus*						Species or species habitat likely
Spotted Turtle-dove	*Streptopelia chinensis*			Declared			Species or species habitat likely
House Sparrow	*Passer domesticus*			Declared			Species or species habitat likely
Domestic Duck	*Anas* sp.			Declared			
Domestic Goose	*Anser* sp.			Declared			

Appendix B

Appendix B:

Flora taxa recorded during the current desktop survy not recorded in the DES 2009 report

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Appendix B

Table 1. Flora taxa recorded during the current desktop survey not recorded in the DES 2009 report (EPBC ACT = N, NPW Act = S, NRM Act = S, AMLR (Adelaide and Mount Lofty Region) = R in DES 2009 Report; This table is the equivelent to Appendices 4 (Native flora) and 5 (Invasive) in the DES 2009 report.

Family	*Scientific Name*	Common Name	NPW Act	NRM Act	EPBC Act	WoNS	AMLR	Occurs on Torrens Island
PUNCTARIACEAE	*Asperococcus bullosus*							X
CHENOPODIACEAE	*Atriplex cinerea*	Coast Saltbush						X
CHENOPODIACEAE	*Atriplex paludosa ssp. cordata*	Marsh Saltbush						X
AVICENNIACEAE	*Avicennia marina ssp. marina**	Grey Mangrove						X
CYPERACEAE	*Bolboschoenus caldwellii*	Salt Club-rush					Rare	X
BRYOPSIDACEAE	*Bryopsis plumosa*							X
CRUCIFERAE	*Cakile maritima ssp. maritima*	Two-horned Sea Rocket						X
AIZOACEAE	*Carpobrotus chilensis*	Angled Pigface						X
AIZOACEAE	*Carpobrotus rossii*	Native Pigface					Least concern	X
CLADOPHORACEAE	*Chaetomorpha linum*							X
CRASSULACEAE	*Crassula exserta*	Large-fruit Crassula	Rare				Rare	X
CUTLERIACEAE	*Cutleria multifida*							X
LILIACEAE	*Dianella brevicaulis*	Short-stem Flax-lily					Not threatened	X
CHENOPODIACEAE	*Enchylaena tomentosa var. tomentosa*	Ruby Saltbush					Least concern	X
ULVACEAE	*Enteromorpha clathrata*							X
ULVACEAE	*Enteromorpha ralfsii*							
MYRTACEAE	*Eucalyptus leucoxylon ssp. leucoxylon*	South Australian Blue Gum					Not threatened	X

Appendix B

Family	*Scientific Name*	Common Name	NPW Act	NRM Act	EPBC Act	WoNS	AMLR	Occurs on Torrens Island
CYPERACEAE	*Gahnia filum*	Thatching Grass					Vulnerable	X
COMPOSITAE	*Gamochaeta pensylvanica*							X
ZANNICHELLIACEAE	*Lepilaena cylindrocarpa*	Long-fruit Water-mat					Vulnerable	X
EPACRIDACEAE	*Leucopogon parviflorus*	Coast Beard-heath					Not threatened	X
SARCOMENIACEAE	*Malaconema roeanum*							X
CACTACEAE	*Opuntia stricta*	Erect Prickly Pear		Declared		WoNS		X
PORTULACACEAE	*Portulacaria afra*	Dwarf Jade Plant						X
CHENOPODIACEAE	*Rhagodia candolleana ssp. candolleana*	Sea-berry Saltbush					Least concern	X
CHENOPODIACEAE	*Tecticornia arbuscula*	Shrubby Samphire					Vulnerable	X
CHENOPODIACEAE	*Tecticornia pergranulata ssp. pergranulata*	Black-seed Samphire					Vulnerable	X
CONVOLVULACEAE	*Wilsonia rotundifolia*	Round-leaf Wilsonia					Vulnerable	X
ORCHIDACEAE	*Caladenia tensa*	Greencomb Spider-orchid, Rigid Spider Orchid			Endangered		Rare	
ORCHIDACEAE	*Prasophyllum validum*	Sturdy Leek-orchid	Vulnerable		Vulnerable			
COMPOSITAE	*Chrysanthemoides monilifera*	Bitou Bush, Boneseed		Declared				
COMPOSITAE	*Chrysanthemoides monilifera subsp. monilifera*	Boneseed		Declared				
LEGUMINOSAE	*Genista linifolia*	Flax-leaved Broom, Mediterranean Broom, Flax Broom		Declared				
VERBENACEAE	*Lantana camara*	Lantana, Wild Sage		Declared		WoNs		

Appendix B

Family	*Scientific Name*	Common Name	NPW Act	NRM Act	EPBC Act	WoNS	AMLR	Occurs on Torrens Island
GRAMINEAE	*Nassella neesiana*	Chilean Needle grass		Declared		WoNs		
ROSACEAE	*Rubus fruticosus aggregate*	Blackberry, European Blackberry		Declared		WoNs		
SALICACEAE	*Salix spp.*	Willows		Declared		WoNs		
SOLANACEAE	*Solanum elaeagnifolium*	Silver Nightshade		Declared		WoNs		
TAMARICACEAE	*Tamarix aphylla*	Athel Pine		Declared		WoNs		
LEGUMINOSAE	*Ulex europaeus*	Gorse, Furze		Declared		WoNs		

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Flora and fauna study: Torrens Island Energy Park

Report to:
Coffey Natural Systems
November 2009

FINAL REPORT

DES
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Executive summary

Donato Environmental Systems was engaged by Coffey Natural Systems on behalf of AGL Energy Limited to conduct a flora and fauna study of a defined area (the study area) comprising a proposed Torrens Island Energy Park (energy park). To characterise flora and fauna in the study area DES conducted a desktop review, database searches, site familiarisation visits and engaged in personal communications with relevant stakeholders.

The study area has been substantially disturbed by past activities with a negative ecological impact on flora and fauna.

Flora species were well documented and 56 native species were identified. Of these species two are of conservation significance. In particular, *Adriana quadripartita* (Rare Bitterbush) was identified as uncommon in the Southern Lofty Region and has received considerable attention as the host plant of the butterfly *Theclinesthes albocincta* (Bitter-bush Blue). Locations of individual specimens will need to be GPS-marked and mapped before footprint clearance.

A total of 81 exotic flora species were identified in the study area or are likely to occur in the study area. One species is a weed of national significance, ten are declared plants in South Australia and nine are moderate to high threats in the Adelaide and Mount Lofty Region (AMLR). Ecological communities in the study area were well documented and divided into three main communities: shoreline, salt marsh and sand dune.

The desktop review identified a freshwater soak and the possibility of seven species of frog that may occur in the study area, including two species classified as threatened and of conservation significance. No frogs were recorded in the soak during frog monitoring, which was attributed to salinity in the soak reaching 6000 EC units.

Reptiles were reasonably well documented and a total of 36 reptile species were identified that may occur in the study area. Two threatened species were identified.

A total of five bat species were identified in the study area. Other than bats the mammal fauna was dominated by introduced mammals, three of which are classified as feral pests.

A comprehensive bird list exists and a total of 155 species were identified that may be present in the study area. Of these, 42 bird species are threatened or of conservation significance. Wader roosting habitat was identified north and east of Lot 303 but not in the development envelope.

All environmental risks, after successful implementation of management, were identified as low.

Introduction

Donato Environmental Systems (DES) was engaged by Coffey Natural Systems (CNS) on behalf of AGL Energy Limited (AGL) to conduct a flora and fauna study of a proposed Torrens Island Energy Park (energy park) at the Torrens Island Power Station (TIPS) on Torrens Island, near Adelaide, South Australia. The energy park comprises a liquefied natural gas (LNG) production plant, a storage tank, re-gasification units and a power station expansion (gas turbine peaking plant). Construction and maintenance of the energy park have the potential to affect biological diversity in the location of the proposed site. All areas that may be affected by the energy park are referred to as the study area.

CNS provided DES with a brief titled: Flora and Fauna Study Brief: Torrens Island Energy Park, August 2009 (the brief).

Objectives

The two objectives of the flora and fauna study were to:

- characterise the existing terrestrial flora and fauna communities, important habitats and species of the study area; and
- assess the issues and potential short and long-term impacts of the proposed development on the terrestrial flora and fauna within the study area, and develop mitigation and management to avoid such impacts.

Project description

AGL is the owner and operator of TIPS. TIPS was constructed between 1963 and 1981 and was purchased by AGL in July 2007. TIPS currently comprises two gas-fired power stations with a generating capacity of 1 280 MW of electricity from eight turbines. The power station is fuelled with natural gas supplied via the South-east Australia Gas (SEAGas) pipeline from Victoria and the Epic Energy Moomba to Adelaide pipeline (MAP). AGL is investigating the feasibility of expanding its existing facilities at the TIPS site to create an energy park that will allow for progressive development of a series of energy-based projects. The currently proposed components of the energy park are described in the following sections.

Gas storage facility and production plant

The gas storage facility would receive natural gas from a pipeline (either SEAGas or MAP), cool and liquefy the gas and store it in a cryogenic tank on site for use when required. The gas storage facility would be approximately 45 m in diameter and 50 m high.

The stored LNG may be used in the following ways:

- electricity generation – vaporise LNG and transfer to TIPS during peak demand;
- gas supply – vaporise LNG and transfer natural gas to the pipeline network for sale in South Australia;
- security of supply – vaporise LNG for either power generation or transfer to the South Australia gas distribution network in time of supply disruption; or
- LNG supply – transfer to road tanker for sale to market as an alternative, lower carbon-intensity fuel for heavy duty trucks or remote power generation.

Power station expansion

The future expansion of TIPS may be in the form of new open cycle or combined cycle gas turbines in addition to the existing power stations. The total expanded capacity could be in the order of 1 800 MW, of which 480 to 900 MW would be new.

The final mix and type of new installed capacity is still to be determined and a number of options are being evaluated including peaking generation of:

- up to four units of 120 to 170 MW each; or
- two units of 240 to 280 MW each.

Project timing

The timing of the power station expansion is subject to market demand and is therefore still to be determined. However, construction is expected to commence within the proposed five-year approval term. The gas storage facility is proposed to commence construction after 2014.

Location of study area

Torrens Island is approximately 15 km north-west of Adelaide, near the eastern end of the Lefevre Peninsula. Torrens Island is situated with the Port River on the west, Angas Inlet on the south and Barkers Inlet on the east. A causeway across the Angas Inlet connects Torrens Island with Garden Island, which in turn is connected to the mainland by the Grand Truckway Bridge over the North Arm. The northern end of the island tapers off into St Vincent Gulf.

The energy park will be located adjacent to the existing TIPS in the south-west corner of Torrens Island (Figure 1) and will be in proximity to the following features:

- waterways that include Angas and Barker Inlets, the North Arm and Port River;
- the Small Boat Club in Angas Inlet;
- North Arm shipyards; and
- port side lands and berths as well as the industrial area, which lies between the Port River and the residential areas on the LeFevre Peninsula.

Figure 1. The study area (yellow line) that includes all areas that may be affected by the proposed energy park and land allotments 302, 303 and 805 (pink lines) (figure provided by CNS).

Climate and geology

The climate is a hot mediterranean climate with mild wet winters and hot dry summers [1]. Summer and winter maximum average temperatures are 29ºC and 15ºC, respectively [1]. Torrens Island is a low-lying island with large areas subject to inundation with high tide. Tides are semidiurnal to mixed tides with usually two low and high tides in 24 hours with dodge tides several times a year [2].

The main landforms in the area are inter- and supra-tidal flats, dunes and chenier ridges that comprise marine sands and muds [2]. Dunes are restricted to the western margin of Torrens Island and are 2 to 4 m in height and consist of well to moderately sorted quartz sand [2]. The dunes are approximately 1 to 2 m thick and overlay intertidal sediments [3]. The chenier ridges are long low ridges, generally 0.5 to 2 m in height, separated by intertidal flats and

occur amongst mangroves and salt marsh communities [2]. They comprise shell and sand deposited by storm waves underlain by intertidal sediment [2].

Environmental legislation

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

A referral for the project will be submitted to the Department of the Environment, Water, Heritage and the Arts (DEWHA) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999), to assess for actions that are likely to have a significant impact on matters of national environmental significance. The project may be declared as a controlled action or not a controlled action depending on whether the project is likely to have a significant impact on one or more matters protected by the EPBC Act 1999. If the project is declared a controlled action the proposed action must be assessed by the Minister using one of a number of options including:

- assessment on referral information;
- assessment on preliminary documentation;
- assessment based on Environmental Impact Statement of Public Environment Report; or
- assessment by public enquiry.

South Australian *Development Act 1993*

AGL intends for the energy park to be permitted as public infrastructure and therefore Crown development controlled by the provisions of section 49 of the *Development Act 1993*. Torrens Island is zoned *Public Purpose (Power Station)* under the *Land not within a Council (Metro) Development Plan,* which falls under the *Development Act 1993*.

An environmental and social assessment report (ESAR) is not a set requirement of approvals under section 49 of the *Development Act 1993*. However, AGL considers an ESAR will assist the Development Assessment Commission (DAC), the public and the Minister in understanding the potential impacts of the project and in making an informed decision regarding its approval. Therefore AGL intends to submit an ESAR along with the development application for the project.

South Australia *National Parks and Wildlife Act 1972*

Torrens Island Conservation Park

The study area adjoins the Torrens Island Conservation Park (TICP), which falls under the *National Parks and Wildlife Act 1972* (NPW Act 1972), section 29 [4] (Figure 2). The original boundary of the TICP, declared in 1963, only included the north region of Torrens Island but in 2005 the boundary was altered to include nearly all of Torrens Island [4]. The TICP encompasses the majority of Torrens Island with exception of land zoned as *Public Purpose (Power Station)*, which includes TIPS, the study area and the Quarantine Power Station north of TIPS. There is no management plan in place for TICP despite it having ecological significance [5].

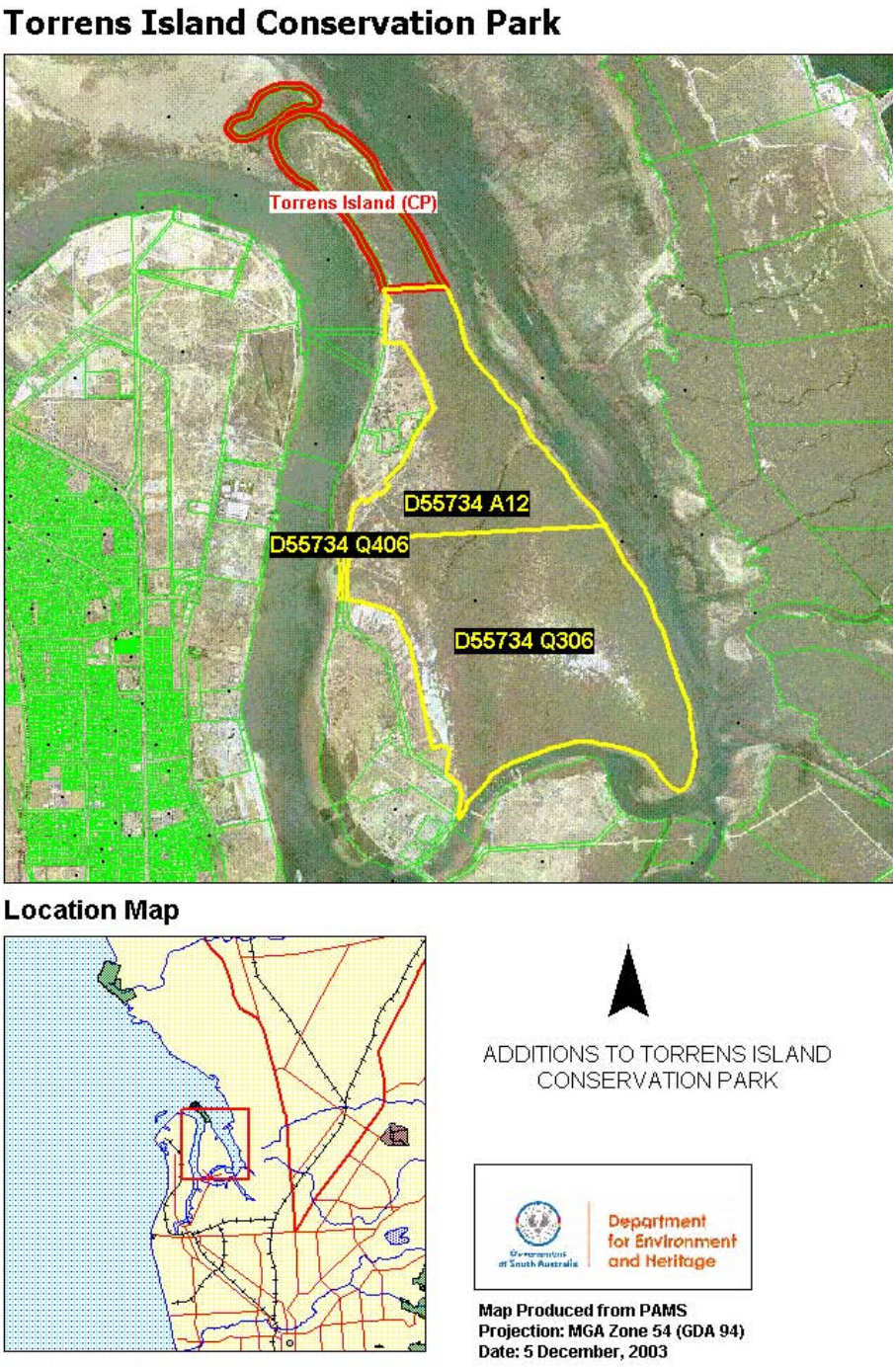
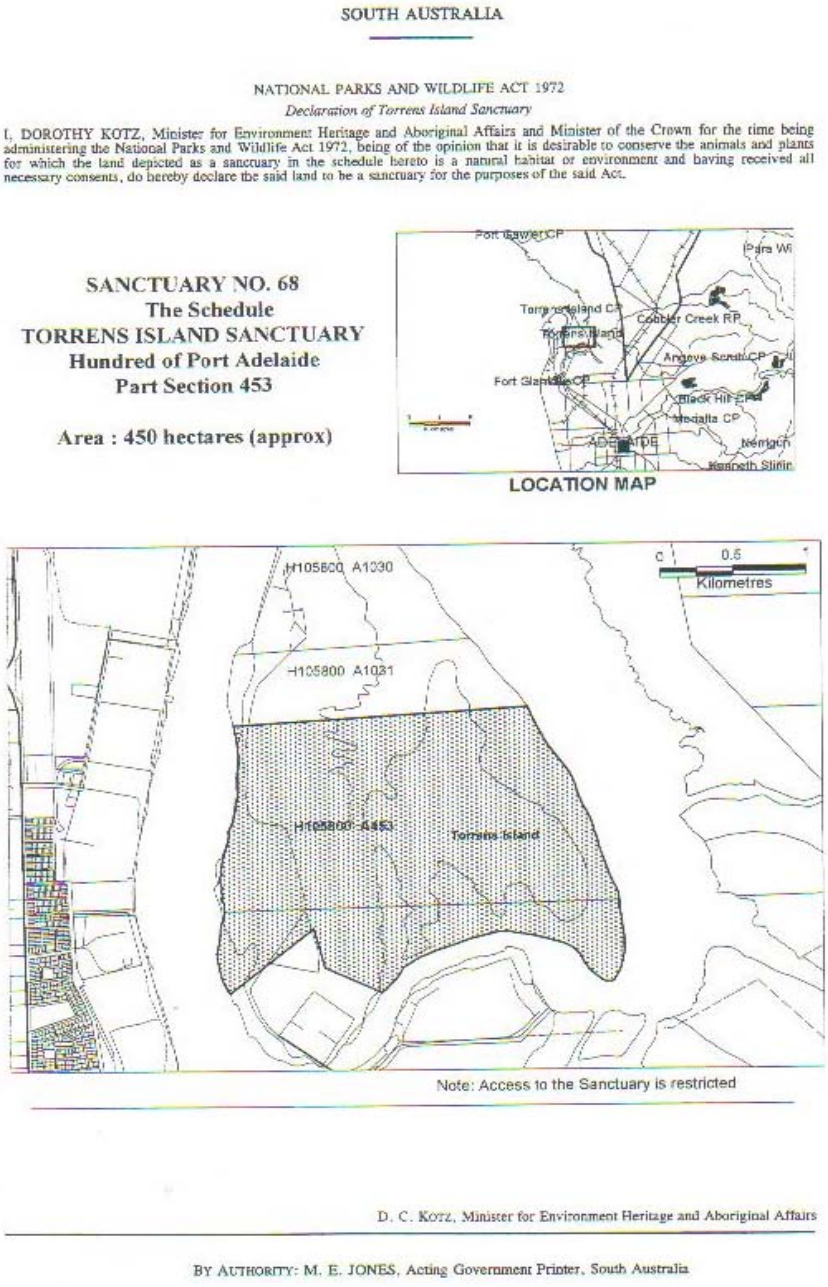


Figure 2. Torrens Island Conservation Park (TICP) with original 1963 boundary (red line) and the region added in 2005 (yellow line) (figure provided by Rychard Oleszczyk, AGL TIPS)

Torrens Island Sanctuary

The Torrens Island Sanctuary (TIS) covers approximately 450 ha of the southern half of Torrens Island and comprises all of Lot 303 in the study area (see Description of Study Area for explanation of land allotments) (Figure 3) [6]. The TIS is a private sanctuary declared in 1998 under the NPW Act 1972, section 44 [6] where the owner of the land is Generation Lessor Corporation (GLC), who own freehold Lot 303 in the study area. It was established as a sanctuary as the Minister was of the opinion that it was desirable to conserve the animals and plants for which the land is a natural habitat or environment and where the land is private land, the owner and occupier of the land consented to a declaration under section 44 [6, 7]. As private land in the

declaration of the sanctuary, the owner of that land can request that the land cease to be a sanctuary and revoke the declaration under which the land constituted a sanctuary [7].



SOUTH AUSTRALIA

NATIONAL PARKS AND WILDLIFE ACT 1972

Declaration of Torrens Island Sanctuary

I, DOROTHY KOTZ, Minister for Environment Heritage and Aboriginal Affairs and Minister of the Crown for the time being administering the National Parks and Wildlife Act 1972, being of the opinion that it is desirable to conserve the animals and plants for which the land depicted as a sanctuary in the schedule hereto is a natural habitat or environment and having received all necessary consents, do hereby declare the said land to be a sanctuary for the purposes of the said Act.

SANCTUARY NO. 68
The Schedule
TORRENS ISLAND SANCTUARY
Hundred of Port Adelaide
Part Section 453

Area : 450 hectares (approx)

LOCATION MAP

H105800 A1030

H105800 A1031

H105800 A453

Torrens Island

0.5 Kilometres

Note: Access to the Sanctuary is restricted

D. C. KOTZ, Minister for Environment Heritage and Aboriginal Affairs

BY AUTHORITY: M. E. JONES, Acting Government Printer, South Australia

Figure 3. Torrens Island Sanctuary (TIS) (figure provided by Rychard Oleszczyk, AGL TIPS)

Other South Australian Legislation

Other South Australian legislation that may be relevant to the project includes:

- *Environmental Protection Act 1993*;
- *Aboriginal Heritage Act 1988*;
- *Dangerous Substances Act 1979* and Dangerous Substances Regulations 2002;
- *Native Title (South Australia) Act 1994* and Native Title (South Australia) Regulations 2001;

- *Controlled Substances Act 1984* and associated regulations;
- *Natural Resources Management Act 2004*;
- *Native Vegetation Act 1991*;
- *Petroleum and Geothermal Energy Act 2000*; and
- *Adelaide Dolphin Sanctuary Act 2005*.

Metropolitan Open Space System (Conservation)

The study area adjoins the Metropolitan Open Space System (MOSS) conservation zone, a network of parklands through Adelaide that will be a clearly linked system of public and private open space in and around the whole metropolitan area (Figure 4) [8]. One objective of the MOSS conservation zone is 'the continued provision of essential infrastructure to the power station and quarantine station on Torrens Island including road access, transmission lines and gas feed lines, in a manner that will, in the long term, contribute to the conservation, rehabilitation and improvement of the zone' [9]. The Development Plan for the City of Port Adelaide Enfield (City) states that development involving the production of energy should be consolidated around the existing power station in the southern portion of the zone and an unspecified area of the northern portion of the *Public Purpose (Power Station)* zone should be rehabilitated and provided as a landscape buffer between the power station and the adjoining MOSS conservation zone [9].

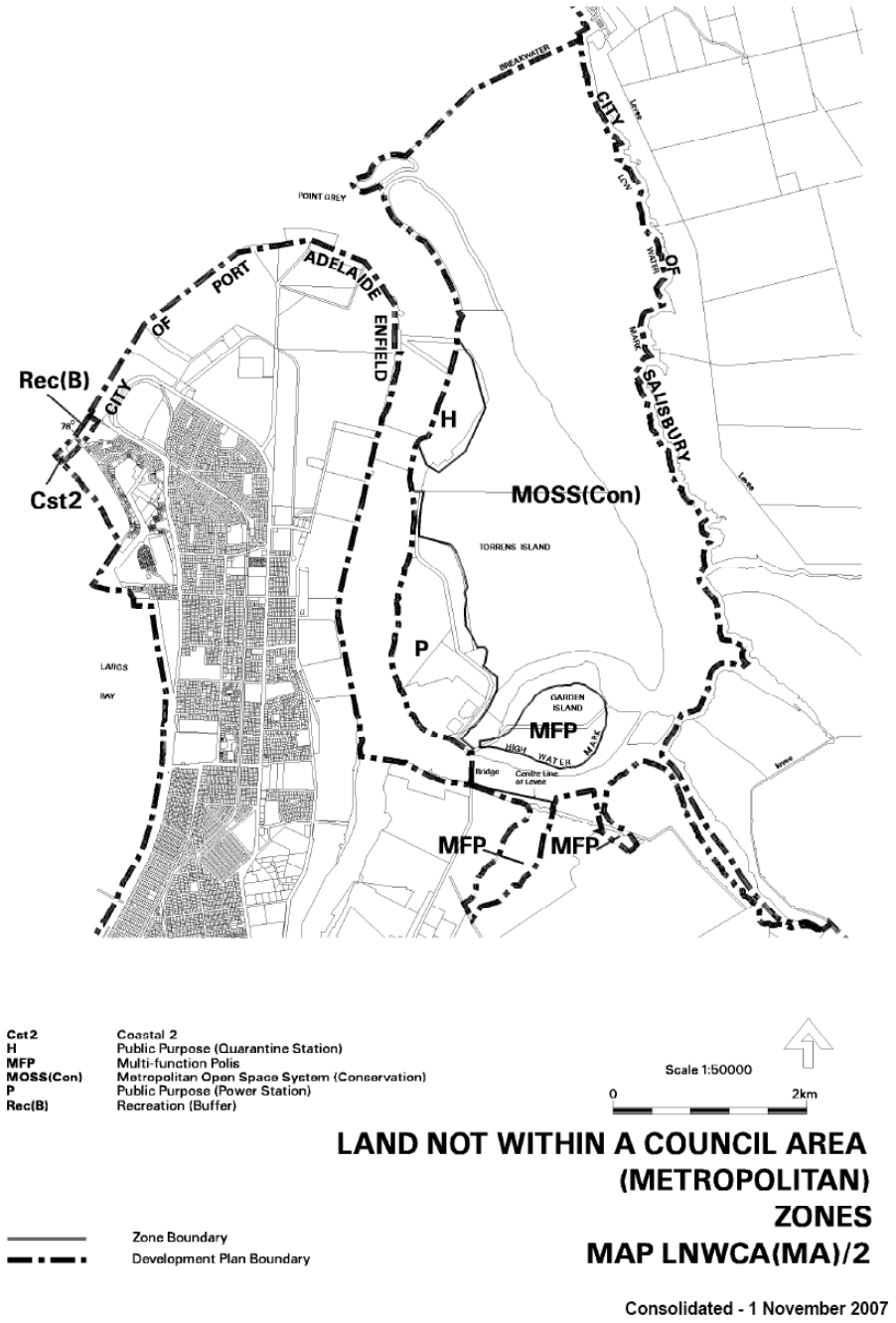


Figure 4. Metropolitan Open Space System (MOSS) Conservation Zone (figure sourced from http://www.planning.sa.gov.au/download.cfm?DownloadFile=BC1E753D-F203-0D46-A62263A8A97B09A9)

Port River Barker Inlet

Torrens Island is situated within the Port River and Barker Inlet, a large tide-dominated system that supports a diverse array of wildlife. The inlet consists of wide tidal mudflats framed by salt marsh, grey mangroves, wetlands and low-lying sand dunes [10]. The Port River and Barker Inlet is situated in the TICP and the Adelaide Dolphin Sanctuary. There are a number of wetlands of national importance throughout the inlet and it is included in the Directory of Important Wetlands in Australia [10, 11]. In addition to being an important breeding and nursery area for fish, numerous migratory bird species of international and national importance are dependent on estuarine habitats within the inlet [11].

Description of study area

The study area lies adjacent the existing TIPS site and comprises three land allotments: Lot 302, Lot 805, and Lot 303 (Figure 1 and Table 1). There are also three land allotments adjacent the study area: Lot 301, Lot 402 and Lot 605 (Figure 5, Table 1).

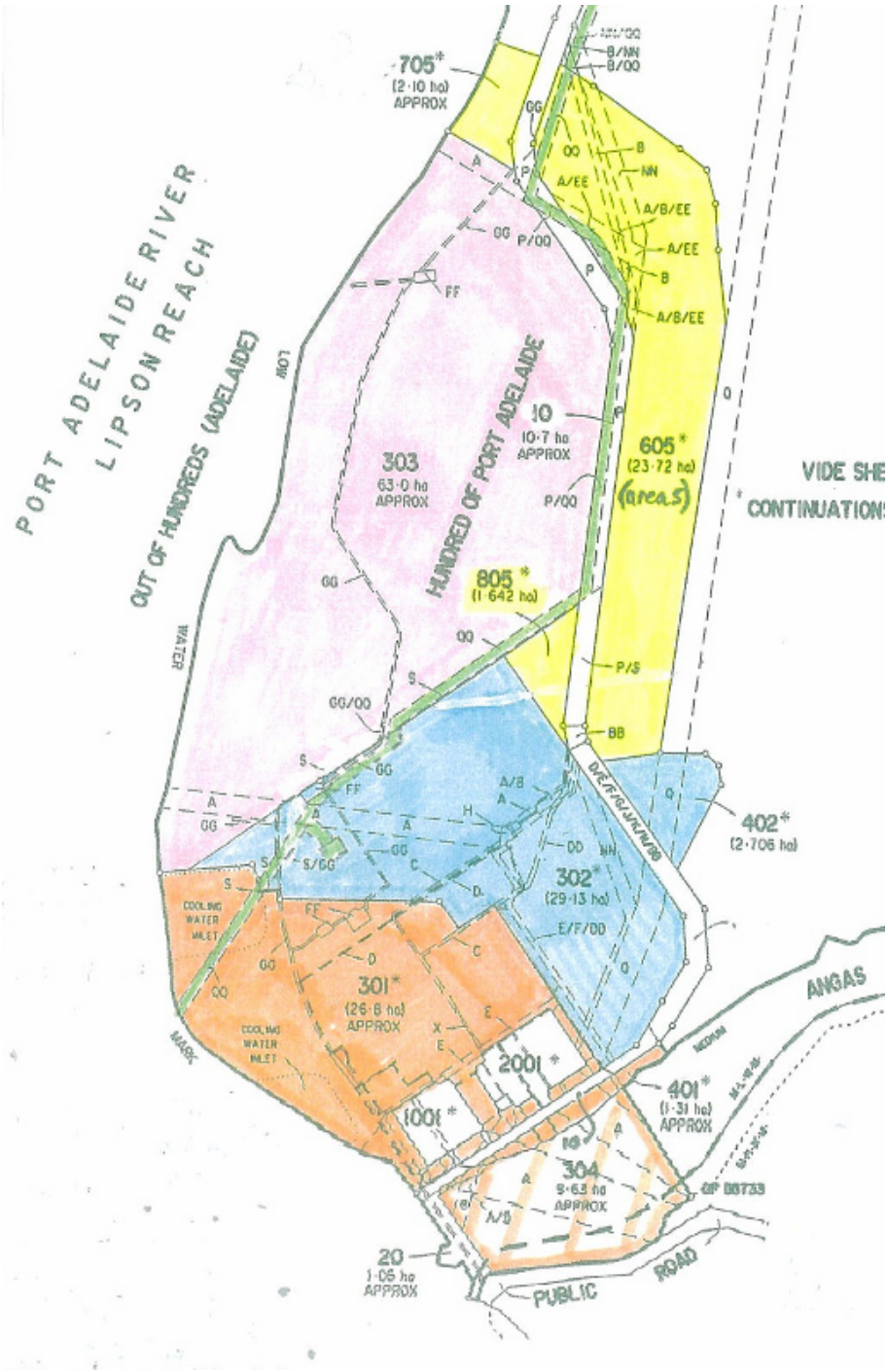


Figure 5. Land allotments adjacent the study area; Lot 301, Lot 402 and Lot 605 (figure provided by Rychard Oleszczyk, AGL TIPS).

Table 1. Area, title description and context regarding Torrens Island for land allotments within and adjacent to the proposed study area [12]

Lot	Area (ha)	Title description	Project context
301	26.8	Freehold, wholly owned by GLC. Leased by AGL.	Current location of power station.
302	29.13	Freehold, wholly owned by AGL.	Location of LNG production plant and power station expansion.
303	63.00	Freehold, wholly owned by GLC. Leased by AGL.	Location of gas storage facility.
402	2.706	Freehold, wholly owned by AGL.	Adjacent to study area.
605	23.72	Freehold, wholly owned by Primary Industries and Resources South Australia (PIRSA).	Adjacent to study area.
805	1.64	Freehold, wholly owned by PIRSA.	Adjacent to study area.

The proposed location of the gas storage facility is in Lot 303 adjacent a roadway between Lot 303 and Lot 302 (Figure 1). The gas storage facility will be 45 m in diameter and 50 m high surrounded by a triangular fence (Figure 1). The proposed power station expansion is located in Lot 302 and there is nothing proposed for Lot 805 (Figure 1). Two gas pipelines traverse the study area through Lot 303, the Epic Energy MAP runs north-east along the north-western margin of the proposed gas storage facility and the SEAGas pipeline runs along the roadway between Lot 303 and Lot 302 (Figure 6) [13].

The details of the layout of the gas storage, production facility and the power station expansion have not been finalised.

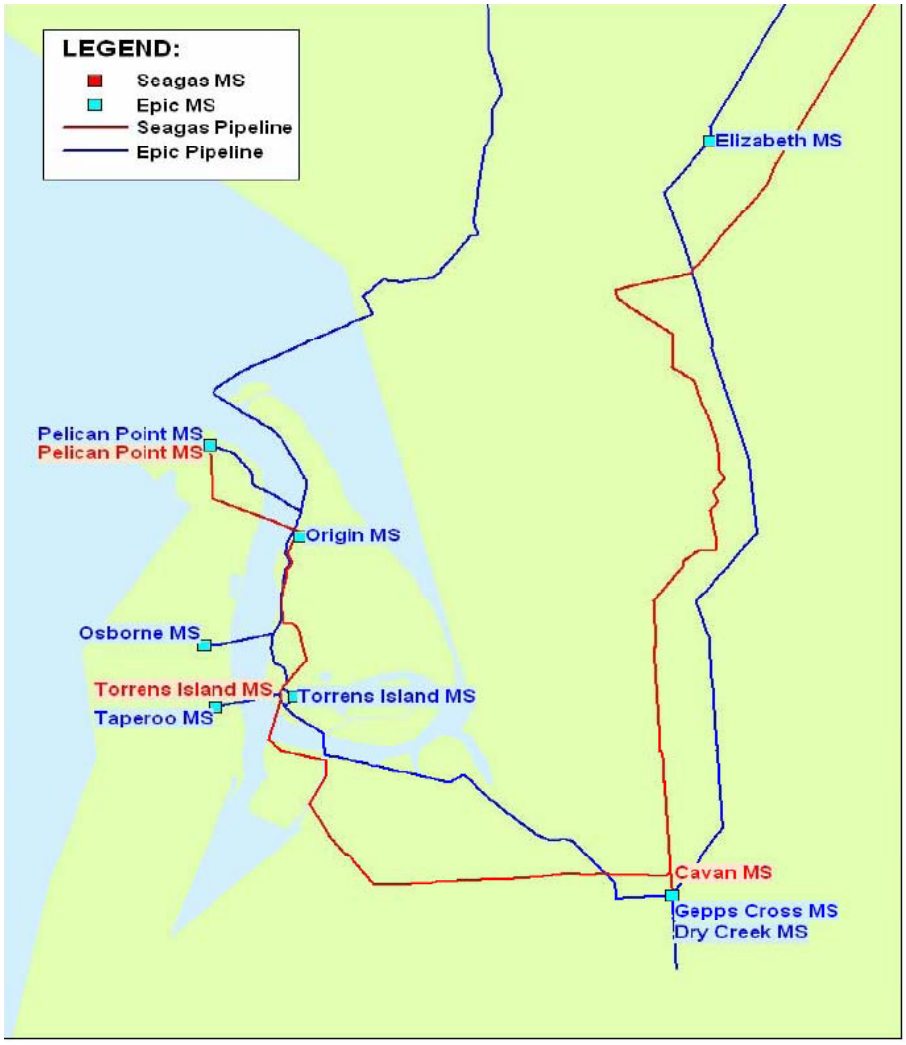


Figure 6. Gas pipelines traversing the study area through Lot 303, the Epic Energy MAP (Epic MS) and the SEAGas Pipeline (Seagas MS) (figure provided by Rychard Oleszczyk, AGL TIPS).

Previous land use

The study area has been substantially disturbed by past activities that started at European settlement and have had negative ecological impacts on flora and fauna (Figure 7) [14].

Past activities include:

- construction of TIPS commencing in 1963;
- sand extraction;
- dumping of dredged muds;
- filling;
- construction of roads, pipelines (gas and cooling water) and ancillary infrastructure;
- rubble and asbestos burial;
- construction of Sea-bird Rescue Rehabilitation Facility; and
- early land uses (quarantine station, recruitment centre, internment camp) [14].

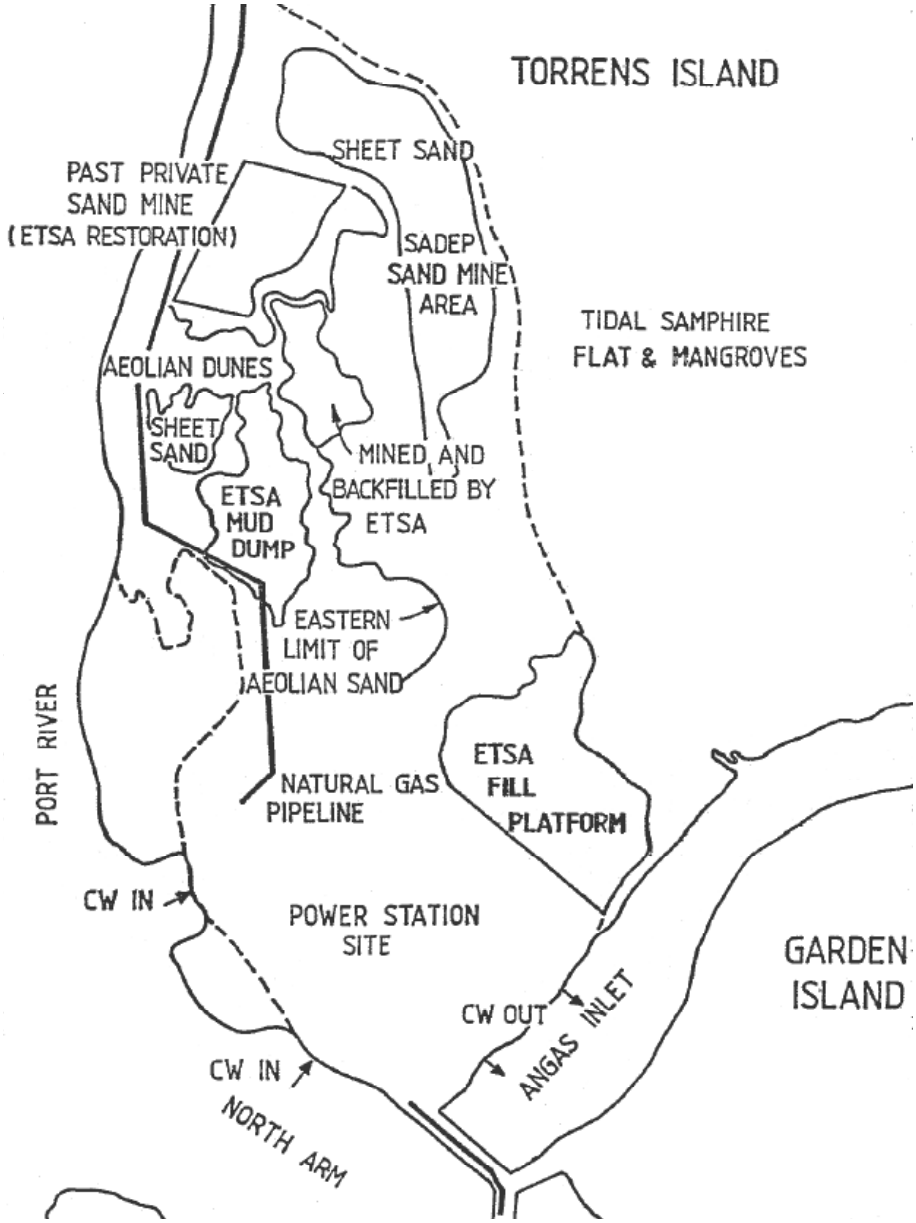


Figure 7. Past land use activities in the study area (figure provided by Rychard Oleszczyk, AGL TIPS).

Past land use has resulted in a reduction in the biological diversity of Torrens Island, and sand mining and the dumping of dredged materials and mixed landfills has altered the topography and soil structure in the study area [14]. The distribution of mangroves in the study area has been significantly reduced and there is evidence that significant stands of native pine and sheoak woodlands once existed and were removed for building materials and firewood [14]. The combination of the removal of habitat and the introduction of the rabbit (*Oryctolagus cuniculus*), fox (*Vulpes vulpes*) and cat (*Felis catus*) has contributed to the decline of native mammal and bird species [14]. It was only towards the beginning of the 1990s that work began on controlling the rabbit population and revegetation of the sand mining lease areas [14].

Methodology

Characterisation of flora and fauna – desktop review

To characterise the flora and fauna present or that may be present in the study area, existing information was reviewed through desktop analysis. Specifically, a species list, the conservation status of each species (national, state and regional) and species habitat requirements and sensitivity to change were included in the characterisation. Terrestrial plants (native and exotic) and ecological communities, amphibians, birds (migratory, nomadic and vagrant), reptiles, mammals (including bats) and invertebrates of conservation significance were included in the characterisation. The sources from which the majority of data for the desktop review was extracted are described in Appendix 1.

Database searches

Information regarding flora and fauna in the study area was extracted from three database searches (see Appendix 1 for further description):

1. EPBC Act 1999 database on matters of national environmental significance [15].
2. Biological Databases of South Australia (BDSA, Department for Environment and Heritage (DEH)) data extraction [16].
3. Birdata search engine, custom search [17].

Categories used to assess conservation significance

Flora and fauna species present or likely to be present in the study area with a conservation status at a national, state or regional level were discussed in relation to their conservation significance in the study area. Conservation status classifications are described in Table 1 and Appendix 2. Species classified at national and state levels are considered threatened and species classified at a regional level are considered to have conservation significance.

Exotic flora and fauna species present or that may be present in the study area with a national, state or regional listing were discussed in relation to their significance as pests in the study area. Classifications used to assess exotic flora and fauna species are described in tables 1, 2 and Appendix 3.

Site familiarisation visits

Two site familiarisation visits were conducted to investigate vegetation identified from satellite imagery. DES staff visited the site on 31 August and 23 September 2009 during which they made visual inspections and photographed potential habitats.

Bat monitoring

DES conducted echolocation-recording bat surveys to fill in gaps in the desktop analysis. Bat presence and species data was collected with some limited behaviour data using Anabat™ SD1 echolocation devices (Titley Electronics, Ballina, New South Wales, Australia).

The AnaBat™ SD1 division ratio was set to 16 and sensitivity was set between 6 and 7. The echolocation devices record onto compact flashcards and the data is downloaded using CFC Read software and viewed through Analook W software (www.titley.com.au/anabatsoftware.htm).

Nocturnal bat surveys were conducted in six locations (Table 2, Figure 8) over two blocks of four nights from 18 to 22 and 26 to 30 October 2009. The bat detectors were programmed to record from sunset for a continuous period of four hours, logging the frequency, number and time of bat passes. Each bat

pass was recorded as sequence file. Anabats were positioned to record bat passes over the freshwater soak and at five other locations (Table 2).

Bat species were identified from a private voucher call library and reference work by Pennay 2004 [18].

Source: Satellite imagery - Google Earth, 2009.

Figure 8. Locations of Anabat™ SD1 echolocation devices (Titley Electronics, Ballina, New South Wales, Australia) used to monitor bats from 18 to 22 and 26 to 30 October 2009. Refer to Table 2 of report for descriptions of monitoring locations.

Table 2. Anabat location and corresponding description

	Ecological community	Description	Land allotment	Latitude	Longitude
1	Shoreline	Mangrove canopy	Lot 303	138°31'07.6"E	34°48'08.7"S
2	Shoreline	Mangrove canopy	Lot 303	138°31'04.07"E	34°48'12.94"S
3	Salt marsh	Salt marsh canopy	Lot 303	138°31'07.3"E	34°48'02.4"S
4	Sand dune	Light post	Lot 302	138°31'06.0"E	34°48'12.3"S
5	Sand dune	Freshwater soak	Lot 303	138°31'12.1"E	34°48'02.2"S
6	Sand dune	Near *Acacia pycnantha*	Lot 303	138°31'17.2"E	34°47'57.5"S
7	Sand dune	Near *Acacia pycnantha*	Lot 303	138°31'13.9"E	34°47'37.6"S

One bat pass was defined as a continuous sequence of at least two echolocation calls from a passing bat [19]. A minimum gap of five seconds between passes was applied to ensure each call sequence was in fact a separate pass [18]. Because individual bats cannot be counted with an acoustic method [19], bat activity was quantified by counting the number of bat passes during each four-hour survey [20].

Bats alter their calls while feeding and drinking, producing a series of pulses increasing in slope, frequency and speed, culminating in a buzz [18]. Terminal feeding, drinking and social interaction buzzes emitted by insectivorous bats [21] were also counted, and these behavioural buzz rates are expressed as a buzz-to-bat passes ratio. The ratio of these buzz-to-bat passes provides a measure of behavioural effort per unit of flight activity [18, 20, 22, 23].

For this report, echolocation data from all species was grouped to analyse gross patterns of activity of insectivorous bats in the airspace above the water body.

Frog monitoring methodology

Frog calls were monitored using an Digital Voice Recorder XC-0279, set with a high sensitivity setting coupled with an Electret Condenser Telescopic Microphone, E-2600.

The recording devices were set at the freshwater soak (Figure 9) to record each entire night from 18 to 22 and 26 to 30 October 2009.

Wader roosting habitat assessment

DES conducted a visual assessment of wader roosting habitat within and immediately adjacent to the study area on 18 October 2009 (Figure 1 and Appendix 14).

Personal communications

DES staff liaised with CNS and TIPS staff on several occasions to obtain information regarding the energy park and existing information for flora and fauna in the study area and on Torrens Island.

Limitations

The characterisation of flora and fauna in the study area was primarily based on desktop review of existing information, in particular for flora, reptiles, mammals and birds. Since only a few studies have been conducted on Torrens Island given its restricted nature, DES was limited in its ability to adequately characterise all the flora and fauna in the study area. Although DES conducted amphibian and bat surveys it must be acknowledged that repeated sampling across multiple seasons and years would yield data of higher accuracy regarding amphibians and bats in the study area.

It should also be noted that biases in bat data exist as not all bat calls are identifiable to species and some bat species, such as *Nyctophyllus* have a

low amplitude call and can predominantly hunt by sight and thus, are rarely detected with echolocation recording devices.

In the case of flora, the distribution of *Adriana quadripartita* (Rare Bitterbush) is unknown. Other than in the south-east corner of Lot 303 and in Lot 805, no information exists regarding its occurrence in the rest of the study area (Figures 9 and 10). In 2008 Conservation Volunteers Australia (CVA) mapped *A. quadripartita* populations in the southern region of Torrens Island, including the TIS, however, it is uncertain whether they identified each individual (Figure 10).

Another limitation of the characterisation is that for most of the reports and internal documents reviewed, no methodologies were provided. Therefore, DES cannot assume that all species of flora and fauna potentially occurring in the study area have been identified. Variables including the length of the sampling period and the season in which sampling took place can influence the number of species detected. In addition, of the few studies that have described flora and fauna on Torrens Island, nearly none of them specify where the surveys were conducted. Thus, it is difficult to know if the study area was included in these studies.

Description of the proposed developments was essentially only comprised of development envelopes. Consequently, the risk assessment analysis can only be conducted on a generic level.

Results

Characterisation of flora and ecological communities

Flora

Native flora species present in the study area were well documented. The vegetation is highly modified and disturbed and the understorey comprises predominantly invasive weed species. Nevertheless the overstorey appears to have notably recovered through direct plantings, woody weed removal and natural regeneration in addition to reduced rabbits numbers (at times) and favourable rainfall.

The desktop review identified 56 species of flora in 32 families, of which 31 were present in the study area and an additional 25 were present in adjacent land allotments (Table 1 and Appendix 4). Taxonomic order for flora followed Barket et al. (2005) [24].

Two species of conservation significance were identified in the study area, both classified as uncommon in the Southern Lofty Region (SLR) (Table 3).

Table 3. Flora species of conservation significance in the SLR present in the study area (see Table 1 and Appendix 2 for definitions of classifications used to assess conservation significance of flora)

Family	Species name	Common name	Status in SLR
Convolvulaceae	*Wilsonia humilis*	Silky Wilsonia	Uncommon
Euphorbiaceae	*Adriana quadripartita*	Rare Bitterbush	Uncommon

A total of 81 exotic plant species in 27 families were identified, of which 21 were present in the study area and a further three were present in land allotments adjacent the study area. An additional 57 exotic plant species were identified for Torrens Island and are likely to occur in the study area (Table 1 and Appendix 5). One species was identified as a weed of national significance, ten as declared plants in South Australia and nine as moderate to high threats in the Adelaide and Mount Lofty Region (AMLR) (Table 4). See Appendix 5 for further discussion on listed exotic plant species.

Table 4. Listed exotic plant species present or that may be present in the study area. National (N), state (S) and regional (R) classifications are provided (see Table 1 and Appendix 3 for definitions of classifications used to assess exotic flora)

Species name	Common name	N	S	R	Present	May be present
Asparagus asparagoides	Bridal Creeper	X	X	X	X	
Lyceum ferocissimum	African Boxthorn		X[1]	X	X	
Marrubium vulgare	Horehound		X[1]			X
Asphodelus fistulosus	Onion Weed		X[1]			X
Oxalis pes-caprae	Soursob		X[1]	X		X
Cynara cardunculus	Artichoke Thistle		X[1]		X	
Tribulus terrestris	Caltrop		X[2]			X
Euphorbia terracina	False Caper		X	X	X	
Olea europaea cuspidata	Olive		X	X[3]	X	
Suaeda baccifera				X		X
Mesembryanthemum crystallinum	Common Iceplant			X	X	
Carpobrotus edulis edulis	Hottentot Fig			X	X	
Ehrharta villosa var. maxima	Pyp Grass			X		X
Juncus acutus	Sharp Rush			X		X

[1] Control required in part of the state only (trade and movement usually restricted throughout the State), landowners are required to take action and destroy or control plant [2].
[2] Notifiable throughout the state, the presence and locations must be reported to the local NRM group or regional NRM board [2].
[3] Weed that is considered a high regional priority [4].

Ecological communities

Ecological communities in the study area were well documented and can be divided into three main ecological communities: shoreline, salt marsh and sand dune (Figure 9) (see Table 1, appendices 4 and 5 for species identified in each community). There are also five salt marsh communities in land allotments adjacent the study areas that have been described in Appendix 6.

Source: Satellite imagery - Google Earth, 2009.

Figure 9. Ecological communities (shoreline, salt marsh and sand dune) identified in the study area including the freshwater soak. Identified locations of *Adriana quadripartita* (Rare Bitterbush) in the study area are shown (original figure provided by CNS).

Shoreline community

The shoreline community, in the intertidal to supra-tidal zone, is referred to as *Avicennia marina var. resinifera* dense low forest to low woodland [2]. In the study area this community is restricted to the south-east corner of Lot 303. The community is dominated by the Grey Mangrove *Avicennia marina var resinifera* and covers 2139 ha within Barker Inlet and can form extensive communities up to 2 km wide [2]. Within this zone the community experiences tidal flooding, which varies daily to every second day [2]. Tree height may be up to 6.5 m along the seaward edge of the community and as low as 2.5 m along the landward edge [2]. Within the more elevated parts of the mangrove community a lower stratum comprising *Sclerostegia arbuscula*

and *Sarcocornia quinquefora* may occur where the canopy is more open [2]. In addition, small species such as *Threlkeldia diffusa* and the introduced *Cakile maritima* tend to grow on shore margins [14].

Salt marsh community

The salt marsh community in the intertidal to supra-tidal zone is referred to as *Sclerostegia arbuscula*/*Sarcocornia quinqueflora* dense low heath to open dwarf scrub and is dominated by *Sclerostegia arbuscula* and *Sarcocornia quinqueflora* [2]. This community is subject to tidal inundation of varying frequency and winter flooding [14]. The salt marsh community abuts the shoreline community in the south-east corner of Lot 303. In the Barker Inlet the salt marsh community covers 612 ha [2].

Plant species diversity in this class is low, however the vegetation structure varies considerably with an average cover of 82.6% and average shrub height of 38.7 cm [2]. Generally, *Sclerostegia arbuscula* forms a sparse to moderately dense upper stratum layer overlying a moderately dense to dense ground stratum predominated by *Sarcocornia quinqueflora* [2]. At some sites, however, the *Sarcocornia quinqueflora* ground stratum layer is absent and at other locations dense *Sarcocornia quinqueflora* occurs without the *Sclerostegia arbuscula* overstorey [2]. *Wilsonia humilis* and *Suaeda australis* are regularly present and occasionally co-dominate the ground stratum layer with *Sarcocornia quinqueflora* [2]. The introduced *Samolus repens* is often present, forming distinctive patches. The minimum, average and maximum site elevation for the salt marsh community is 0.50, 0.81 and 0.98 m (Australian Height Datum), respectively [2].

Sand dune community

The sand dune community covers approximately 106 ha in the greater Torrens Island region and occurs in Lot 303, Lot 805 and Lot 302 in the study area where it is interspersed with bare saline flats [2]. Unlike the shoreline and salt marsh communities, the sand dune community is in relatively poor condition, which is not surprising given its history of land use since work commenced on the power station site in 1963. Fotheringham [2] refers to the community as reclaimed and disturbed tidal habitat as the communities within them have adjusted or are adjusting to disturbance resulting from land reclamation, sand mining and effluent discharge. Most of Lot 303 was sand mined and or backfilled and an area just east of the salt marsh community in the south-west of the lot was used as a mud dump.

The vegetation has also been greatly altered by the introduction of many weeds and intensive grazing by a large rabbit population [2], although seedlings of *Callitris gracilis* in Lot 303 indicate that rabbits may be under control. In addition, many native species have been planted from other areas of Australia as part of the rehabilitation project carried out by TIPS. These species are from Western Australia (WA), were selected based on their salt tolerance and are concentrated in the north-west corner of Lot 303 [14]. CVA have since 1992 been involved in the seed collection, propagation and planting of flora in the TIS, which comprises most of Lot 303 [25]. Some of its revegetation attempts were observed in the south-eastern corner of Lot 303 along the road to the Quarantine Power Station during the site familiarisation visits.

Vegetation is not dispersed uniformly across the sand dune community. Aeolian dunes, 2 to 4 m in height, are distinguishable and run in a south-east direction through Lot 303 with the largest patches of dune occurring midway up the western margin of Lot 303 and towards the south-east corner of Lot 303, midway along the southern margin of Lot 303. The centre of Lot 303 is predominantly what is referred to as sand-mined and back-filled grounds with only sparse vegetation. The sand dunes community is a mixture of vegetation types that can be broadly referred to as dune low woodland, heath to open low scrub.

The overstory is dominated by *Acacia pycnantha*, scattered individuals of *Callitris gracilis*, the introduced *Schinus molle var. areira* and *Acacia longifolia sophorae,* which is particularly concentrated in Lot 805. According to Fotheringham [2] the lower chenier ridges, subject to occasional storm surge inundation, are dominated by *Nitraria billardierei* forming a dense heath with low diversity. Throughout the rest of the sand dune community mixed shrub species generally form the upper stratum and include *Olearia axillaris*, *Myoporum insulare*, *Alyxia buxifolia*, *Acacia ligulata*, *Pittosporum angustifolium* and the introduced *Lycium ferrocissimum* [2]. Underneath these, mixed shrubs occur including *Rhagodia candolleana*, *Pimelea serpyllifolia*, *Tetragonia implexicoma*, *Senecio sp. (lacerates)* and *Dianella revoluta* [2]. *Ficinia nodosa*, *Disphyma crassifolium* and sparsely distributed *Muehlenbeckia gunnii* have been identified midway along the western margin of Lot 303 along with the exotic species *Carpobrotus edulis edulis*, *Euphorbia terracina* and *Mesembryanthemum crystallinum* [26, 27]. *Adriana quadripartita* has been identified in the south-east corner of Lot 303 and Lot 805 [27, 28] (Figures 8 and 9).

In Lot 303 where the proposed gas storage facility is located, a freshwater soak containing *Typha domingensis* is surrounded by *Acacia longifolia sophorae*, scattered individuals of *Allocasuarina verticillata* and the exotic *Nicotiana glauca* and *Oenothera stricta* [27] (Figure 9). During the site familiarisation visits, the soak contained water with an average salinity of 3350 EC units and average pH of 7.2 at an average temperature of 14.7ºC on 31 August 2009, which increased to 6000 EC units recorded on 23 September 2009.

Threatened species, ecological communities and species of conservation significance

The ecological community peppermint box grassy woodland of South Australia, was listed as threatened and the species *Tecticornia flabelliformis* was listed as vulnerable under EPBC Act 1999. *Centrolepis cephaloformis cephaloformis* was listed as rare under the South Australia NPW Act 1972. None of the species are likely to occur in the study area and they will not be considered in further reporting (for further discussion regarding *Tecticornia flabelliformis* and *Centrolepis cephaloformis cephaloformis* see Appendix 7).

Wilsonia humilis (Silky Wilsonia)

Wilsonia humilis was identified as uncommon in South Australia and the SLR but common on Torrens Island by Lang and Kraehenbuehl (1986) [2] (Table 3). *W. humilis* is a prostrate shrubby plant found growing on high, infrequently inundated samphire [27]. Little is known of its ecology and therefore [26] suggested that some importance should be placed on its occurrence on Torrens Island. It was rated by Lang and Kraehenbuehl (1986) as uncommon in South Australia and the SLR, however the plant is common

in the Barker Inlet and particularly on Torrens Island and near Pt Gawler [2]. In the study area it has been identified in the salt marsh community (2) [27]. The BDSA database extraction listed 11 survey records for *W. humilis* from 1990 outside the study area on the eastern margin of Lot 605 in similar habitat (D. G. Fotheringham, Tidal and Salt Marsh Communities) [16]. Given the association of *W. humilis* with the salt marsh community it is unlikely to occur anywhere else in the study area.

Adriana quadripartita (Rare Bitterbush) and the butterfly *Theclinesthes albocincta* (Bitter-bush Blue)

Adriana quadripartita (Rare Bitterbush) was identified as uncommon in the SLR [29, 30] and is of significant importance for butterfly *Theclinesthes albocincta* (Bitter-bush Blue) [31]. *A. quadripartita* communities have been identified in the south-east corner of Lot 303 and in Lot 805 in an 8 ha remnant [27, 28]. The BDSA database extraction listed three records for *A.quadripartita* [16]. One survey record in 1997 identified it just north of the Quarantine Power Station (R. K. Sandercock and R. J. Ferguson, Coastal Dune and Clifftop) [16]. One opportune record identified it just north of the north-western end of salt marsh community and another opportune record identified it in the salt marsh vegetation east of the study area and adjacent land allotments (State Herbarium of South Australia) [16].

A.quadripartita usually occurs in coastal and near coastal sand dune systems [31]. In 2008 CVA mapped locations of *A.quadripartita* on Torrens Island and have since planted several hundred in TICP (personal communications with Rychard Oleszczyk) (Figure 10, Table 1 and Appendix 8). *A.quadripartita* has received considerable attention as the host plant of the butterfly *T. albocincta* [31, 32]. The larvae of *T. albocincta* in South Australia exist solely on *A. quadripartita* and not surprisingly the butterfly only occurs in coastal regions of South Australia [31].

T. albocincta does not have a national conservation status and is not considered threatened on a large scale [33]. However, municipal populations may be threatened in South Australia by the loss of *A. quadripartita* [33]. *T. albocincta* has been classified as locally common in South Australia [31]. It has been reported that the population of *T. albocincta* has been reduced to a maximum of three isolated populations, including one at Torrens Island [28, 34]. Once one of the more common plants along the Adelaide metropolitan coastline [34], *A.quadripartita* is presently threatened in Adelaide due to the loss of habitat for urbanisation and agriculture, the biggest threat to *A.quadripartita* being coastal housing developments [31, 35].

Figure 10. Locations of *Adriana quadripartita* (Rare Bitterbush) mapped by Conservation Volunteers Australia (CVA), 2008 (GPS coordinates provided by Rychard Oleszczyk, AGL TIPS, image sourced from Google Earth April 6 2007) (see Table 1, Appendix 8 for GPS coordinates).

Coastal management policies have already recognised the dependence of the butterfly on *A.quadripartita* and prioritised and executed revegetation programs establishing *A.quadripartita* corridors for *T. albocincta* [29-31, 34]. Unpublished survey data has shown that the disturbed section of population on Torrens Island from the construction of the SEAGas pipeline has revegetated naturally from the seed bank and is now mainly composed of *A. quadripartita* [28]. As part of their mitigation procedures SEAGas in addition to site restoration activities, is committed to significant net gain offset projects away from pipeline easement, contributing towards the protection, restoration and biodiversity improvements, and sponsorship of research into the *T. albocincta* was one such offset [36] (see Appendix 8 for further discussion).

Fauna
Amphibians

The desktop review identified seven frog species that may occur in the broader region (Table 1 and Appendix 9), including two species classified as threatened and of conservation significance (Table 5). No frogs were recorded in and around the soak during frog monitoring. The salinity of the water in the soak was found to be unsuitable for amphibians (6 000 EC units on 23 September 2009). The water salinity had risen from 3350 EC units (31 August 2009), this lower salinity may have represented the effects of significant rainfall the preceding week. Given that the salinity is expected to continue to rise during the summer, it is likely the soak will always be uninhabited by frogs.

The presence of freshwater for successful egg development in frogs is necessary, even for populations that breed in coastal areas [37]. Golden Bell Frog (*Litoria raniformis)* tadpoles can tolerate salinity levels of 6 parts per thousand (ppt) (3000 EC unit equivalent) without any apparent effects, however at 8 ppt (4000 EC units equivalent) or higher, growth rates decrease and mortality rates increase [38]. The presence of six species of frog (including Brown Treefrog (*Litoria ewingii*) and Common Eastern Froglet (*Crinia signifera*) was observed to be unaffected up to around 3000 EC but amphibian diversity declined rapidly between 3000 and 6000 EC and above 6000 EC no amphibians were detected [39].

The desktop review identified 28 frog species found in South Australia however of these only 15 are likely to be found in the south-east of the state [40]. Torrens Island falls into what is referred to by Frog Census as the Central Districts, Mount Lofty Ranges and Adelaide Plains region and based on the distributions and habitat preferences of these 15 frogs, there are seven frog species that could potentially be present in the broader region [40-42] (Table 1 and Appendix 9).

The Golden Bell Frog is listed as vulnerable and the Brown Toadlet (*Pseudophryne bibroni*) as rare under the South Australia NPW Act 1972 and within the AMLR (Table 5). Taxonomic order for amphibians follows Robinson (2000)[43].

Table 5. Threatened frog species that may be present in the broader region. State (S) and regional (R) classifications are provided (see Table 1 and Appendix 2 for definitions of classifications used to assess conservation significance of fauna)

Species name	Common name	S	R
Litoria raniformis	Golden Bell Frog	V	
Pseudophryne bibroni	Brown Toadlet	R	V

Of these two species, Common Froglet (*Crinia signifera*) and Spotted Grass Frog (*Limnodynastes tasmaniensis*) have been identified in the region surrounding Torrens Island [44]. The Common Froglet was identified in 1997 and 2000 in the wetland adjacent to the NTA radio mast in Barker Inlet and in 2005 near south Magazine Road on the salt pan side. The Spotted Grass Frog was identified in the wetland adjacent to the NTA radio mast in 1997 and 2000 [44]. Both these species are commonly recorded in Frog Census and are widely distributed within the south-east of South Australia [40].

Considering the salinity of the freshwater soak and the probable absence of fresh surface water, frogs are not likely to currently exist amongst native habitats on the island. Frogs may be present in artificial habitats associated with infrastructure and watered gardens.

Reptiles

Reptiles have been reasonably well documented for southern Torrens Island from studies on ETSA land. Descriptions of habitat associations have been documented for selected species with varying levels of detail. A total of 22 reptile species have been identified in the southern region of Torrens Island [27] and an additional 14 species that may occur in the study area based on distribution and habitat associations [41, 42] (Table 1 and Appendix 10). Taxonomic order for reptiles follows Swanson (2007) [45].

Two species of reptiles that may be present in the study area are species of conservation significance (Table 6).

Table 6. Reptile species of conservation significance present in south Torrens Island (TI) and that may be present in the study area. Regional (R) classifications are provided (see Table 1 and Appendix 2 for definitions of classifications used to assess conservation significance of fauna)

Species name	Common name	R	South TI	May be present
Pseudemoia entrecasteauxii	Southern Grass Skink, Tussock Cool-skink, Entrecasteaux's Skink	V	X	X
Notechis scutatus	Eastern Tiger Snake	V		X

Threatened reptile species

The Southern Grass Skink, *P. entrecasteauxii*, is found in a variety of forest and grassland habitats and on the Adelaide Plains along the coast, in reed beds and samphire communities and, given the prevalence of these habitats in the study area or adjacent the study area, it is likely that this species may occur in the study area [42]. The Eastern Tiger Snake, *N. scutatus* is associated with open sclerophyll and river floodplains and because of its association with water it may occur in the study area [42].

Reptile habitat

Few reptiles were identified in the samphire regions but more in habitats of high ground such as sand dunes [27]. The most evident species was the Painted Dragon (*Ctenophorus pictus*) which was widespread among dune vegetation [27]. The Four-toed Earless Skink (*Hemiergis peronii*) was also common in dune regions under litter and rubbish [27]. One exception was the Common Dwarf Skink (*Menetia greyii*), which was captured on saline ground in *Melaleuca halmaturorum* surrounded by samphire [27]. The Marble Gecko (*Christinus marmoratus*) was commonly observed under the loose bark of *Acacia pycnantha* and *Allocasuarina* species but was not observed elsewhere [27]. Of the eight species identified in the BDSA data extraction nearly all of the records were made in the mangroves on the eastern side of Torrens Island [16].

Threats to reptiles

The primary threat to Australian reptiles is the loss of habitat caused by overgrazing by domestic stock, cropping, urban development and predation by introduced mammals such as foxes, cats, rats and dogs [42].

Mammals

Bat monitoring results

Five bat species were identified in the bat monitoring (Table 1 and Appendix 11). A total number of 1508 bat calls were recorded over 8 nights across seven locations (Figure 8), of which 625 were unable to be identified (Table 1 and Appendix 11). Gould's wattled bat, *Chalinolobus gouldii*, was recorded calling 204 times across all seven survey locations (Table 1 and Appendix 11). Social calls were recorded on the 28 and 29 October 2009, four and one calls, respectively, at survey location 2 indicating the likely presence of a roost in the mangroves (Table 1 and Appendix 11). Social calls were unable to be identified to species but were possibly made by *C. gouldii* as four calls from this species were recorded at the same location immediately after the social calls.

Chocolate wattled bat, *Chalinolobus morio*, was recorded only three times in the sand dune community in the north of Lot 303 across four nights (Table 1 and Appendix 11). Species of *Mormopterus,* freetail bats, were recorded 514 times across all locations. *Mormopterus* calls are unidentifiable to species, however, it is possible that two species were recorded [46] (Table 1 and Appendix 11). The highest number of identifiable calls was for *Mormopterus* species which appear to be territorial, with individuals frequently occurring with another species. A total of 160 calls were identified as *Tadarida australis*, White-striped freetail bat, across all survey locations (Table 1 and Appendix 11). *T. australis* is a migratory species arriving in spring, thus the presence of these calls indicates that surveys were timed correctly. Two calls from *Vespadelus* species were identified in the sand dune community in the north of Lot 303. *Vespadelus* calls are unidentifiable to species, however, it is possible that there were two species [46] (Table 1 and Appendix 11). The species *T. australis*, *C. gouldii* and *Mormopterus planiceps* were reported above the mangrove canopy in southern Torrens Island in large numbers by [27].

The number of calls recorded during the sampling period is average for the habitat in the study area (David Donato, pers. comm.). The data is extremely variable for each species and there does not seem to be any correlations between calls recorded and survey location or survey night. In addition, there do not appear to be any correlations between calls recorded and temperature, relative humidity or wind gust [47]. It is hard to correlate one survey location to another as bats are incredibly mobile. It should also be noted that although no calls were recorded for *Nyctophyllus* species, they have a low amplitude call and can predominantly hunt by sight and thus, a sampling bias against this species exists.

Other bats that have been reported as possibly present in the study area but were not detected and include *Saccolaimus flaviventris*, classified as rare under the NPW Act 1972, *Nyctophyllus* spp., *Scotorepens* spp., *Vespadelus baverstocki*, *Vespadelus rugulus*, *V. Vulturnus* and other *Vespadelus* species (Table 2 and Appendix 11).

Other native mammal species

It is well documented in existing literature that Torrens Island is virtually void of native mammals apart from bats and native rats (tables 2, 3 and Appendix 11).

South Australia Museum records suggest that the Water Rat (*Hydromys chrysogaster*) occurs in Outer Harbour, the North Arm and Port River. To date though it has never been identified on Torrens Island [27]. The South Australia Museum has records of the Bush Rat (*Rattus fuscipe*) occurring in mangroves in Port Gawler [27].

Feral mammal species

Five exotic mammal species may be present in the study area (Table 3 and Appendix 11). The fox, cat and rabbit are listed as feral pests at national and state levels (Table 7). Competition and land degradation by rabbits and predation by foxes and feral cats are considered a key threatening process at a national level [48]. Threat abatement plans (TAP) exist for key threatening processes to establish a national framework to guide and coordinate Australia's response to the impacts of rabbits on biodiversity [48]. At a state level, established policies exist for feral rabbits, foxes and cats [49].

Table 7. Feral mammal species that may be present in the study area. National (N) and state (S) classifications are provided (see Table 1 and Appendix 3 for definitions of classifications used to assess exotic fauna)

Scientific name	Common name	N	S	Present	May be present
Vulpes vulpes	Fox	X	X		X
Felis catus	Cat	X	X		X
Oryctolagus cuniculus	Rabbit	X	X		X

Rabbits and foxes are well documented on Torrens Island, including the TIS. In 1988 estimates of rabbit populations on ETSA land were between 5 000 and 15 000 and in 1989 a rabbit control program was instigated and continued for five years [14]. According to Earth Sanctuaries Limited [14] rabbits appear to be restricted to dune areas where their warrens exist on a number of chenier ridges [2]. The use of 1080 poison on Torrens Island resulted in substantial vegetation regeneration within the dune upper salt marsh communities [2]. CVA has been involved in rabbit control in the TIS since 1992, which incorporates most of Lot 303, including the mapping of rabbit warrens and rabbit eradication [25]. CVA made the observation that the majority of warrens were under *Nicotiana glauca* [25]. In 2001 CVA arranged for Bernhardt's Pest and Weed Control (formerly Adelaide Plains Weed Control) to conduct two days of pindone poisoning, which involved laying out poisoned carrots [25]. The poisoning appeared to be moderately effective.

In 2003 the same company, on behalf of CVA, carried out fumigating and warren implosion on 75 holes in approximately 30 locations [25]. CVA believes that they have been successful at decreasing the rabbit population in the TIS [25]. CVA has investigated the possibility of baiting for foxes but never did due to time constraints (baits need to be checked every couple of days) [25]. However, CVA believes that foxes are still present but not in plague proportions [25]. Earth Sanctuaries Limited [14] suggested that foxes utilise all parts of the island and cross Angas Inlet to Torrens Island. The occurrence of feral cats in the study area or on Torrens Island is less documented.

Birds

Bird species on Torrens Island have been well documented, although comparatively less information was provided for ETSA land compared with flora, reptiles and mammals. Overall the desktop review identified 155 bird species (15 orders) that may be present in the study area (Table 1 and Appendix 12). A total of 42 bird species that may occur in the study area are threatened or of conservation significance (Table 8). Of the 155 bird species present or likely to be present in the study area, 21 are listed under the Japan-Australia Migratory Bird Agreement (JAMBA) and 25 are listed under the China-Australia Migratory Bird Agreement (CAMBA) (Table 1 and Appendix 2). Taxonomic order for birds follows Christidis and Boles (2008) [50].

Threatened bird species

The EPBC Act 1999 database on matters of national environmental significance report identified eight threatened bird species, 16 migratory bird species and 57 listed marine bird species in the area of Torrens Island, Garden Island, Port River, Angas Inlet, North Arm and Barker Inlet [15] (Table 1 and Appendix 13). Of these species only the Australian Painted Snipe (*Rostratula australis*) may occur in the study area. Six species are pelagic and vagrant in nature and not likely to occur in the study area. The remaining threatened species listed in the EPBC Act 1999 report, the Orange-bellied Parrot, is unlikely to occur in the study area and these seven species have been excluded from further analysis (see Appendix 13 for a brief explanation of these species).

Another 41 birds that may occur in the study area are threatened or of conservation significance at a state or regional level (Table 8). Three species, Baillon's Crake, Horsfield's Bronze-Cuckoo and Shining Bronze-Cuckoo, were opportunistically sighted in the south-west corner of Lot 303 between the salt marsh and sand dune communities (Bird Atlas Data 1996-2006, Birds Australia) [16, 17]. The Whimbrel was identified in 1974 in an opportune sighting at the same location (SAOA Newsletters, South Australia Ornithological Association SAOA) [16, 17].

The Australian Painted Snipe is listed as vulnerable under the EPBC Act 1999, rare under the NPW Act 1972 and migratory under the EPBC Act 1999 and CAMBA. It is usually found in shallow inland wetlands, either freshwater or brackish, that are either permanent or ephemeral [51]. Current estimates suggest that the population is declining, with habitat modification and loss through the drainage of wetlands and diversion of water from rivers the greatest threats [51]. There are no records of the species in the study area but it could potentially utilise the salt marsh community.

Table 8. Birds threatened and of conservation significance present or that may occur in the study area. National (N), state (S) and regional (R) classifications are provided (see Table 1 and Appendix 2 for definitions of classifications used to assess conservation significance of fauna)

Order and guild	Species name	Common name	N	S	R	Present
Quails						
Phasianidae	*Coturnix ypsilophora*	Brown Quail		V	V	
Ducks, Geese and Swans						
Anseriformes	*Biziura lobata*	Musk Duck		R		
Anseriformes	*Anas rhynchotis*	Australian Shoveler		R		
Anseriformes	*Oxyura australis*	Blue-billed Duck		R		
Doves and Pigeons						
Colimbiformes	*Phaps elegans*	Brush Bronzewing			U	
Herons, Ibises, Spoonbills and Storks						
Ciconiiformes	*Egretta garzetta*	Little Egret		R		
Ciconiiformes	*Egretta sacra*	Eastern Reef Egret[1]		R		
Ciconiiformes	*Plegadis falcinellus*	Glossy Ibis[1]				
Falcons						
Falconiformes	*Haliaeetus leucogaster*	White-bellied Sea-Eagle[1]		V		
Falconiformes	*Haliastur sphenurus*	Whistling Kite			U	
Falconiformes	*Falco peregrinus*	Peregrine Falcon		R	R	
Cranes, Rails, Moorhens and Coots						
Gruiformes	*Porzana pusilla*	Baillon's Crake		R	R	X
Gruiformes	*Porzana tabuensis*	Spotless Crake		R	U	
Waders						
Charadriiformes	*Haematopus longirostris*	Australian Pied Oystercatcher		R		
Charadriiformes	*Haematopus fuliginosus*	Sooty Oystercatcher		R		
Charadriiformes	*Cladorhynchus leucocephalus*	Banded Stilt		V		
Charadriiformes	*Pluvialis fulva*	Pacific Golden Plover		R		
Charadriiformes	*Charadrius mongolus*	Lesser Sand Plover[1]		R		
Charadriiformes	*Rostratula australis*	Australian Painted Snipe[1]	V	R		
Charadriiformes	*Limosa lapponica*	Bar-tailed Godwit[1]		R		
Charadriiformes	*Numenius phaeopus*	Whimbrel[1]		R		X
Charadriiformes	*Numenius madagascariensis*	Eastern Curlew[1]		V		
Charadriiformes	*Xenus cinereus*	Terek Sandpiper[1]		R		
Charadriiformes	*Actitis hypoleucos*	Common Sandpiper		R		
Charadriiformes	*Tringa glareola*	Wood Sandpiper[1]		R		
Charadriiformes	*Calidris tenuirostris*	Great Knot[1]		R		
Charadriiformes	*Philomachus pugnax*	Ruff (Reeve)[1]		R		
Charadriiformes	*Sterna albifrons*	Little Tern[1]		V		

continued

Order and guild	Species name	Common name	N	S	R	Present
Charadriiformes	*Sternula nereis*	Fairy Tern		E		
Charadriiformes	*Sterna hirundo*	Common Tern[1]		R		
Parrots						
Psittaciformes	*Neophema elegans*	Elegant Parrot		R		
Psittaciformes	*Neophema petrophila*	Rock Parrot		R		
Cuckoos						
Cuculiformes	*Chalcites basalis*	Horsfield's Bronze-Cuckoo			V	X
Terrestrials						
Coraciiformes	*Chalcites lucidus*	Shining Bronze-Cuckoo		R	R	X
Coraciiformes	*Todiramphus sanctus*	Sacred Kingfisher			U	
Passerines						
Passeriformes	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill			U	
Passeriformes	*Anthochaera chrysoptera*	Little Wattlebird			U	
Passeriformes	*Epthianura albifrons*	White-fronted Chat			U	
Passeriformes	*Pachycephala rufiventris*	Rufous Whistler			U	
Passeriformes	*Petroica boodang*	Scarlet Robin		R	V	
Passeriformes	*Cisticola exilis*	Golden-headed Cisticola		R		
Passeriformes	*Petrochelidon nigricans*	Tree Martin			U	

[1]Table 8 refers to species listed under either JAMBA, CAMBA or as migratory under the EPBC Act 1999.

Waterbirds

The majority of birds considered threatened or of conservation significance are collectively referred to as waterbirds and include the following guilds: ducks, geese and swans; herons, ibises, spoonbills and storks; cranes, rails, moorhens and coots; and waders [52]. Waterbirds are found in coastal areas throughout Australia including beaches, rocky shores, sandbanks, mudflats, tidal wetlands and lagoons, which they utilise for feeding and breeding [53]. Many waterbirds are migratory and fly thousands of kilometres each year from distant breeding grounds in the northern hemisphere to feeding grounds in the southern hemisphere. By far the biggest threat to waterbirds is the reclamation of wetlands and the destruction of their feeding and breeding grounds by urbanisation and industrial development, in addition to increasing pollution, introduced species and illegal hunting [54] [55]. Worldwide 44% of waterbird populations are decreasing or have become extinct [54].

The study area and Torrens Island comprises diverse and ecologically important aquatic ecosystems for waterbirds such as mangroves and salt marsh. These coastal habitats provide roosting, sheltering and feeding grounds for waders and seabirds [5]. In addition, Torrens Island is close to the Barker Inlet and St Kilda coastal and marine wetlands which are identified and listed as wetlands of national importance under the EPBC Act 1999. The Barker Inlet wetlands provide significant breeding habitats for 18 species of waders and seabirds and a total of 57 species of waterbirds have been identified in the area, 12 of which are listed under international agreements

[5]. Waterbirds would be likely to occur in the shoreline and salt marsh communities in the study area.

Wader roosting habitat

Examples of wader roosting habitat were identified and photographs are provided in Appendix 14 (see Figure 1 and Appendix 14 for photograph locations). No wader roosting habitats were identified in the study area but were north and east of Lot 303 (Figure 1 and Appendix 14). The presence of these habitats means that wader diversity contiguous to Lot 303 towards the north and east, and potentially in Lot 303, would be high. The wader roosting habitats were characterised by the following features:

- proximity to tidal feeding zones;
- vegetative with diverse flora providing cover during windstorms and extreme high tides;
- presence of saline lagoons providing high tide foraging opportunities; and
- inaccessibility and subsequent minimal disturbance by vehicle or foot making them suitable sites for roosting.

The windward coastal habitats (Figure 3 and Appendix 14) provide roosting in taller vegetation including mangroves, which are the habitats that are used during high tides. The Leeward side habitats (figures 1, 2, 4 to 9 and Appendix 14) provide cover from storms, which are predominately from the south-west. The habitats would be difficult to monitor accurately because of extensive vegetative cover.

Insects, aquatic macroinvertebrates and seeds would be present given that the habitats are well vegetated, providing waders with an abundant food resource. The presence of lagoons provides waders with different feeding zones. Marine feeding zones may be utilised by Whimbrel and Eastern Curlew, classified as rare and vulnerable, respectively by the NPW Act 1972 (Table 8). Shallow waters may be utilised by sandpipers, three of which may be present in the study area, Terek Sandpiper, Common Sandpiper and Wood Sandpiper, are classified as rare by the NPW Act 1972 (Table 8). Non-inundated substrates are utilised by plovers. The Pacific Golden Plover and Lesser Sand Plover may be present in the study area and are classified as rare by the NPW Act 1972 (Table 8).

Migratory waders including Whimbrel, Eastern Curlew, Terek and Wood Sandpiper and Lesser Sand Plover are listed under either JAMBA, CAMBA or as migratory under the EPBC Act 1999.

Terrestrial birds

Passerine and terrestrial birds, which include honeyeaters and insect-eating birds, are terrestrial in nature and utilise a broad range of habitats including woodlands, forests, shrub lands, scrubby habitats and grasslands in addition to coastal shrub land and heaths [56]. Development of urban areas and habitat loss, and degradation and fragmentation are the major threats to these species described as probably declining in the AML, including the draining and filling of swamps for some species [53, 55, 56]. Passerines and terrestrial species would be most likely to occur in the vegetation in the sand dune community in Lot 303, 805 and 302. Potentially they may utilise the revegetation plantations in the north corner of Lot 303.

Other species that may occur in the terrestrial vegetation in the study area include the Brown Quail (*Coturnix ypsilophora*), Brush Bronzewing (*Phaps elegans*), Horsfield's Bronze Cuckoo (*Chalcites basalis*), parrots and falcons.

Impacts

Limitations

DES assessed the potential impacts on terrestrial flora and fauna associated with the construction and operation of the energy park.

The assessment of impacts was based on the locations of the gas storage facility, LNG plant and power station expansion (gas peakers and switch yard) depicted in Figure 1 of the brief, from here on in referred to as the development envelope.

Details regarding the design of the development envelope and related management protocols have not been finalised or provided to DES. Consequently, the assessment of impacts arising from the energy park and the recommendations for the management of associated risks are provided on a generic level (see Table 12).

In addition to the construction of the gas storage facility, LNG plant and power station expansion, DES assumes that other areas within the development envelope will be subject to high levels of disturbance associated with infrastructure such as walkways, roads, support buildings, temporary and permanent waste disposal areas, hardstand areas, fences, firebreaks and storage areas.

Based on the development envelope footprint, the energy park will affect part of the sand dune ecological community and possibly populations of *Adriana quadripartita* (Rare Bitterbush), a flora species of high conservation profile. The shoreline and salt marsh ecological communities within Lot 303 and Lot 805 do not appear to be directly impacted by the energy park.

Approach

The impact assessment approach used here follows that of Standards Australia/Standards New Zealand "Environmental risk management – Principles and process HB 203:2004," (the guide) [57]. The approach takes into account the high degree of complexity of environmental systems and that decisions regarding impacts must often be made when there is still significant scientific uncertainty about potential outcomes. At the core of its approach is the concept of environmental risk management [57].

A qualitative analysis has been used to assess the impacts of the energy park on terrestrial flora and fauna. Impacts are defined as changes to the environment resulting from an event or source of risk, in this case the construction and operation of the energy park. The analysis derives a measure of risk for each impact from a combination of two elements:

- likelihood that an impact will occur; and
- consequence of the impact.

The measures of likelihood and consequence used in the present study are presented in tables 9 and 10, respectively. For both likelihood and consequence each level of the measure is defined by a descriptor and a definition. As suggested in the guide [57] the levels of each category should reflect the needs of the study and the measures used should reflect the nature and needs of the organisation and activity undertaken. In the present study the measures of likelihood are those described in 2.5.3 in the guide

and the measures of consequence are those typically used in the resource industry.

Table 9. Qualitative measures of likelihood

Level	Descriptor	Description
A	Almost certain	Is expected to occur in most circumstances
B	Likely	Will probably occur in most circumstances
C	Possible	Could occur
D	Unlikely	Could occur but not expected
E	Rare	Occurs only in exceptional circumstances

Table 10. Qualitative measures of consequence

Level	Descriptor	Definition
1	Catastrophic	Severe environmental damage. Local species destruction and long recovery period likely. Extensive clean-up required. Impact on a regional scale. Regulatory: license to operate revoked or suspended. Forced site shutdown to closure.
2	Major	Serious environmental damage with major environmental impact. Requires large clean-up efforts. Extends beyond lease boundary. Regulatory: regulation breach, action by regulator likely. Penalties, e.g. fine or infringement notice issued. Possible or actual prosecution.
3	Moderate	Moderate and reversible environmental damage. Clean up possible by site personnel. Confined within lease boundary. Regulatory: technical compliance issue. Possible regulator action. Field notice issued. Exceed statutory limit.
4	Minor	Minor environmental damage restricted to lease and within previously disturbed area. Regulatory: minor technical breach. Internal standard exceeded. Explanation letter to regulator required.
5	Insignificant	No or very low environmental damage and impact confined to small area. Regulatory: no potential legal action. Standard or limit not exceeded.

A risk matrix is used to calculate the measure of risk using likelihood and consequence (Table 11). As outlined in the guide [57], measures of risk are defined as:

E = Extreme risk: immediate action required.

H = High risk: senior management attention needed.

M = Moderate risk: management responsibility must be specified.

L = Low risk: manage by routine procedures.

Table 11. Qualitative risk analysis matrix: level of risk

	Consequence				
Likelihood	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	M	H	H	E	E
Likely	M	M	H	H	E
Occasional	L	M	M	H	H
Unlikely	L	L	M	M	H
Rare	L	L	L	M	M

As instructed [57], what constitutes an acceptable risk level is specific to the activity being analysed and managed. Extreme, high and moderate risks are considered too high to be acceptable and DES has made recommendations for the management and mitigation of these impacts. The residual risk is the level of risk that remains after implementation of management [57].

Where unknown factors exist DES has applied a precautionary approach [57]:

> *Where there are threats of serious or irreversible environmental damage, lack of full scientific uncertainty should not be used as a reason for postponing measures to prevent environmental degradation...rather we put appropriate measures in place in advance of more scientific evidence.*

The subjective assignment of measures of likelihood and consequence to impacts to derive measures of risk were based on:

- the characterisation of flora and fauna communities (where possible);
- viewing existing power generation and associated infrastructure contiguous to the energy park;
- discussions with CNS and AGL TIPS staff;
- two site visits; and
- experience gained at other infrastructure developments.

Identification of impacts

The potential impacts on terrestrial flora and fauna associated with the energy park are shown in Table 12. Impacts may be associated with the construction and use of the gas storage facility, LNG plant and power station expansion (gas peakers and switch yard) or associated infrastructure within the development envelope.

To identify these impacts DES relied on a combination of subjective expert opinion and knowledge gained from other resource development projects. A predictive approach was necessary when identifying impacts of the energy park on terrestrial flora and fauna given that the design and development procedures for the energy park have not been finalised or provided to DES. The distinction between impacts from construction versus operational stages of the development has not been made and it is acknowledged that most impacts will arise during the construction phase with some impacts continuing throughout the operational phase of the energy park.

Assessment of impacts

The assessment of the potential impacts on terrestrial flora and fauna associated with the construction and operation of the energy park are presented in Table 12. For each impact the likelihood, consequence and level of risk is shown in addition to recommendations for risk management and mitigation and residual measures of likelihood, consequence and level of risk (Table 12). The residual level of risk is determined on the assumption of successful and timely implementation of the proposed risk management and mitigation.

The recommendations for risk management and mitigation in Table 12 have been provided in a generic manner. No prescriptive risk management or mitigation is possible without a completed project design and associated management procedures.

Table 12. Assessment of impacts, consequences, risks, proposed risk management and residual risks on flora and fauna from the energy park

Impact	Likelihood	Consequence	Risk level	Risk management and mitigation	Residual likelihood	Residual consequence	Residual risk level
Loss of Rare Bitterbush (parts of Lots 303 and 302)	A	2	E	• Conduct surveys for the presence of *Adriana quadripartita* (Rare Bitterbush) and establish a minimum viable population size. Retain individuals of *A. quadripartita* where necessary to maintain this population. GPS individual specimens, map (as attempted by ACV) and determine the potential population loss from development. Translocate and repopulate for loss of individuals and maintain involvement or funding for revegetation programs in the study area or on Torrens Island. • Articulate management in a species management plan. • Preserve and enhance general vegetation habitats not affected by the energy park in the study area or on Torrens Island.	D	5	L
Vegetation and habitat loss: Sand dune community including freshwater soak (parts of Lot 303)	A	4	M	• Minimise development footprint and vegetation removal from infrastructure and associated walkways, roads, support buildings, temporary dump and storage areas in and around site. Implement management plans and monitoring procedures to minimise the extent of vegetation clearance.	C	5	L
Vegetation and habitat loss: Sand dune community excluding freshwater soak (parts of Lot 302)	A	5	M	• Minimise development footprint and vegetation removal from infrastructure and associated walkways, roads, support buildings, temporary dump and storage areas in and around site. Implement management plans and monitoring procedures to minimise the extent of vegetation clearance.	D	5	L
Runoff and storm water discharge	B	4	M	• Implement management plans and monitoring procedures for capturing and managing water runoff from infrastructure and hardstand areas. • Implement management plans and monitoring procedures for capturing and managing of sediment runoff from infrastructure and hardstand areas.	D	4	L
Habitat integrity degradation (parts of Lots 303 and 302)	D	4	L		D	4	L
Materials handling, disposal and pollution	B	4	M	• Implement management plans and monitoring for materials handling, disposal and pollution abatement.	D	4	L

continued

Impact	Likelihood	Consequence	Risk level	Risk management and mitigation	Residual likelihood	Residual consequence	Residual risk level
Ground water and subaqueous water resource contamination	D	3	M	• Implement or extend existing ground water monitoring programs. • Manage surface water contaminants to avoid seepage and consider where appropriate infrastructure such as lined seepage sumps.	D	4	L
Dust	C	4	M	• Implement dust management plans. Monitor outcomes and act accordingly.	D	4	L
Noise, lights and other disturbance to flora and fauna	B	4	M	• Implement procedures for minimising noise, lights and other disturbance beyond background levels. • Ensure pedestrian and vehicular traffic adheres to established and marked roads and walkways. • Where practicable fence off areas of significant vegetation to avoid disturbance. • Implement management plans and monitoring procedures for noise, lights and other disturbance to flora and fauna.	C	3	L
Exotic flora species – weeds	A	2	E	• Implement management plans and monitoring procedures to avoid the introduction of additional exotic plant species onto Torrens Island and the study area. • Implement management plans and monitoring procedures to minimise the movement of plant material within the study area and Torrens Island. • Continue supporting organisations, including financial support, such as CVA for the control of weeds in the study area and on Torrens Island. • Monitor the spread of weeds in the study for outbreaks of any new species. Prior to construction undertake a survey of weeds in the study area.	D	4	L
Exotic fauna species – feral mammals	B	4	M	• Continue supporting organisations, including financial support, such as CVA in the control of feral mammals in the study area and on Torrens Island.	C	3	L

Discussion of impacts

Vegetation and habitat loss: *Adriana quadripartita* (Rare Bitterbush) (parts of Lots 303 and 302)

A. quadripartita communities have been identified in the south-east corner of Lot 303 and in Lot 805 in an 8 ha remnant [27, 28]. In 2008 CVA mapped locations of *A.quadripartita* on Torrens Island (Figure 10, Table 1 and Appendix 8). However, CVA is uncertain whether they identified each individual (Melita de Vries, pers. comm). Specimens of *A. quadripartita* may potentially exist within the development envelope given the proximity of already identified specimens on its margin (Figure 10). Until specimens of *A. quadripartita* in the development envelope are surveyed, DES has applied the precautionary approach and assumed that *A. quadripartita* does occur in the development envelope. Under this assumption the likelihood of the loss of *A. quadripartita* in the development envelope is almost certain.

A. quadripartita was identified as uncommon in the SLR [29, 30] and is of significant importance as the host plant for the butterfly *Theclinesthes*

albocincta (Bitter-bush Blue) [31, 32]. The larvae of *T. albocincta* in South Australia exist solely on *A. quadripartita* and not surprisingly the butterfly only occurs in coastal regions of South Australia [31]. *T. albocincta* does not have a national conservation status and is not considered threatened on a large scale [33]. However, municipal populations may be threatened in South Australia by the loss of *A. quadripartita* [33]. *T. albocincta* has been classified as locally common in South Australia [31]. It has been reported that the population of *T. albocincta* has been reduced to a maximum of three isolated populations, including one at Torrens Island [28, 34]. Coastal management policies have already recognised the dependence of the butterfly on *A.quadripartita* and prioritised and executed revegetation programs establishing *A.quadripartita* corridors for *T. albocincta* [29-31, 34].

Given the conservation significance of *A. quadripartita,* loss of specimens in the development envelope will be of major consequence, having a major environmental impact. Consequently, in the absence of management and mitigation the level of risk associated with the loss of *A. quadripartita* is extreme.

Vegetation and habitat loss: sand dune community including freshwater soak (part of Lot 303)

The sand dune community affected by the the energy park footprint includes part of Lot 303.

The vegetation community in Lot 303 in the location of gas storage facility is reasonably in tact, regenerating and is utilised by terrestrial birds, bats and reptiles. With development footprint minimisation the affected area is relatively small and would not have a measurable effect on the population viability of any flora or fauna species (other than that already discussed for *A. quadripartita*). Bat monitoring should be conducted regularly to ensure that species diversity and abundance does not decrease below baseline levels presented in this report.

Vegetation and habitat loss: sand dune community excluding freshwater soak (parts of Lot 302)

This vegetation community is severely degraded with considerable loss of habitat and structural complexity. Infrastructure development on Lot 302 in the designated development envelope would have insignificant effect on flora and fauna populations. Nevertheless development footprint minimisation is appropriate.

Vegetation and habitat integrity degradation (parts of Lots 303 and 302)

Habitat degradation via edge affects, barrier affects and fragmentation by the proposed development is discussed here.

Edge affects are expected to be of low severity since the vegetation in the sand dune community is considered to be sparsely distributed and already exposed to the elements. The community is already dominated by weeds, particularly in the understory and this is not expected to change with any perceived edge affect.

Barrier affects are not expected as the components of the energy park are compact, contiguous with existing infrastructure.

Erosion, if managed, is unlikely to be a concern given the flat terrain in the study area.

Each discrete development of the energy park is contiguous to existing developments and in compact square building envelopes. This minimises loss of habitat integrity beyond the development footprint.

Sediment runoff and storm water discharge

Storm water discharge from hardstand areas and infrastructure can carry contaminants (fuel, oil, and chemicals) and sediments to salt marsh or shoreline communities. These habitats can be severely affected by sediment, which disrupts tidal flows, inundation regimes, facilitates weed infestations and changes vegetation community species population dynamics. This is already evident of the existing contiguous developments. Contaminants, including hydrocarbons and metals, carried with sediment into such communities are readily absorbed by biota and become bioavailable. Considering the flat terrain these issues can be appropriately managed.

Materials handling, disposal and pollution

The handling, storage and disposal of fuels, oils, chemicals and hard waste may impact on biodiversity through the loss of vegetation and habitat integrity with deleterious effects on fauna. Contaminants are readily absorbed by tidal communities. Appropriate management of materials and potential pollutants during construction and operation stages are necessary.

Ground water and subaqueous water resource contamination

No information has been provided of the ground water or subaqueous water resources. The freshwater soak is probably a surface expression of a subaqueous water resource. Contamination of such resources can cause detrimental effects on fauna, freshwater soak water quality and habitats, and associated vegetation communities. Monitoring and management of contaminated seepages will be necessary.

Dust

Dust from construction may temporarily cover vegetation and reduce habitat integrity. The construction is not expected to involve considerable amounts of earth moving, nor is the site terrain particularly susceptible to dust creation.

Noise, lights and other disturbance to fauna

Given the proximity of the energy park to the existing TIPS it is unlikely that fauna will be additionally influenced by noise, lights and other disturbances. Bats and nocturnal bird species are impacted by lights and tall structures causing collisions. The disturbance by humans (pedestrian traffic, construction work, vehicular traffic on roads) may impact vegetation, habitat and fauna through a reduction in habitat quality and changes in fauna behaviour for example, breeding. Without field survey data for bats and the habitat provisions available to birds in the study area, DES has applied the precautionary principle. The additional effect is difficult to quantify but is not expected to be significantly different to current risks from existing developments.

Exotic flora species

The sand dune community is already degraded by a diverse range of exotic plant species including 14 exotic flora species listed at either national, state

and regional levels. However, the importation of materials presents the threat of introducing additional exotic species to the site and Torrens Island. The introduction of exotic plants in addition to fungi and other plant pathogens can be considered a major measure of impact. Implementation of a weed management plan is required to identify impacts and reduce risks.

Exotic fauna species

The study area already comprises mammal fauna (other than bats) dominated by feral rabbits, foxes and cats. However, without proper mitigation and management the potential exists for these species to increase in abundance with a severe impact on indigenous fauna. Continual support for cat, fox and rabbit control programs is beneficial. The vegetation communities show considerable regeneration, which is probably a response to past rabbit control. Reptile population abundance and diversity responds well to fox and cat suppression.

Uncertainties in the impact assessment

As described in the brief [57] the analysis of environmental risk often produces results with a high degree of uncertainty. Reasons for uncertainty may include:

- the complexity of the environment and the difficulty in finding a single measure of either the impacts on the environment or the likelihood they will occur;
- statistical fluctuations due to the vulnerability of the various components of the system under study;
- the lack of reliable data on the environmental impacts from a source of risk; and
- the impacts from a source of risk over time are difficult to predict.

As previously mentioned, the uncertainty regarding the details of the layout of the gas storage and production facility and the power station expansion is a limiting factor. DES has assessed the impacts of the energy park on flora and fauna in the study area based on the locations of the gas storage facility, LNG plant and power station expansion (gas peakers and switch yard) in Figure 1 of the brief. Consequently, any deviations in the layout of the energy park from that in Figure 1 of the brief will require a new assessment of impacts.

Conclusions

All environmental risks, subject to successful implementation of all the risk management and mitigation measures, were identified as low. It is imperative that the prescribed management and mitigation measures are implemented to reduce the environmental risks to low. Until these measures have been successfully executed environmental risks will remain at medium and extreme levels.

The risk management and mitigation measures described in Table 12 are those typically associated with construction developments, primarily concerned with development and footprint minimisation, stormwater and runoff mitigation, dust suppression and weed control. Although routine in nature they are important to mitigate impacts outside the development envelope where to more intact and sensitive habitats exist. All these mitigation measures need to be articulated in a management plan or standard operating procedures.

There is specific management procedures associated with *A. quadripartita*. The species needs to be specifically managed, including and not limited to mapping of individuals in the development envelope, propagated and any other measures taken to maintain a viable population of the species.

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Appendices:

1: Sources of information for desktop review
2: Definitions of classifications used to assess conservation significance of native flora and fauna
3: Definitions of classifications used to assess exotic flora and fauna
4: Native flora species present in the study area and adjacent areas
5: Exotic flora species present in the study area and adjacent areas
6: Salt marsh communities adjacent the study area
7: Threatened flora and species of conservation significance that are occur adjacent to the study area
8: *Adriana quadripartita* (Rare Bitterbush) and the butterfly *Theclinesthes albocincta* (Bitter-bush Blue)
9: Amphibian species that may occur in the study area
10: Reptile species that are present in south Torrens Island and may occur in the study area
11: Native mammal species that are present in south Torrens Island and may occur in the study area
12: Bird species that may occur in the study area
13: *Environment Protection and Biodiversity Act 1999* database on matters of national environmental significance report for birds
14: Wader roosting habitat

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Appendix 1: Sources of information for desktop review

The sources of the information used for the desktop review are described below.

Database search engines

Environment Protection and Biodiversity Act 1999 (EPBC Act 1999) database on matters of national environmental significance

Report indicated the potential for threatened species or threatened ecological communities to occur within a specified area. An area search was used with a 0 km buffer. The area searched included Torrens Island, Garden Island, Port River, Angas Inlet, North Arm and Barker Inlet and was bounded by the following coordinates: 34.7529º, 138.5086º; -34.7529º, 138.5328º; -34.8158º, 138.5585º; -34.8218º, 138.5089º (Fig. 1). Eight threatened bird species, 16 migratory bird species and 57 listed marine bird species were identified. One threatened ecological community and one threatened plant species were identified [1].

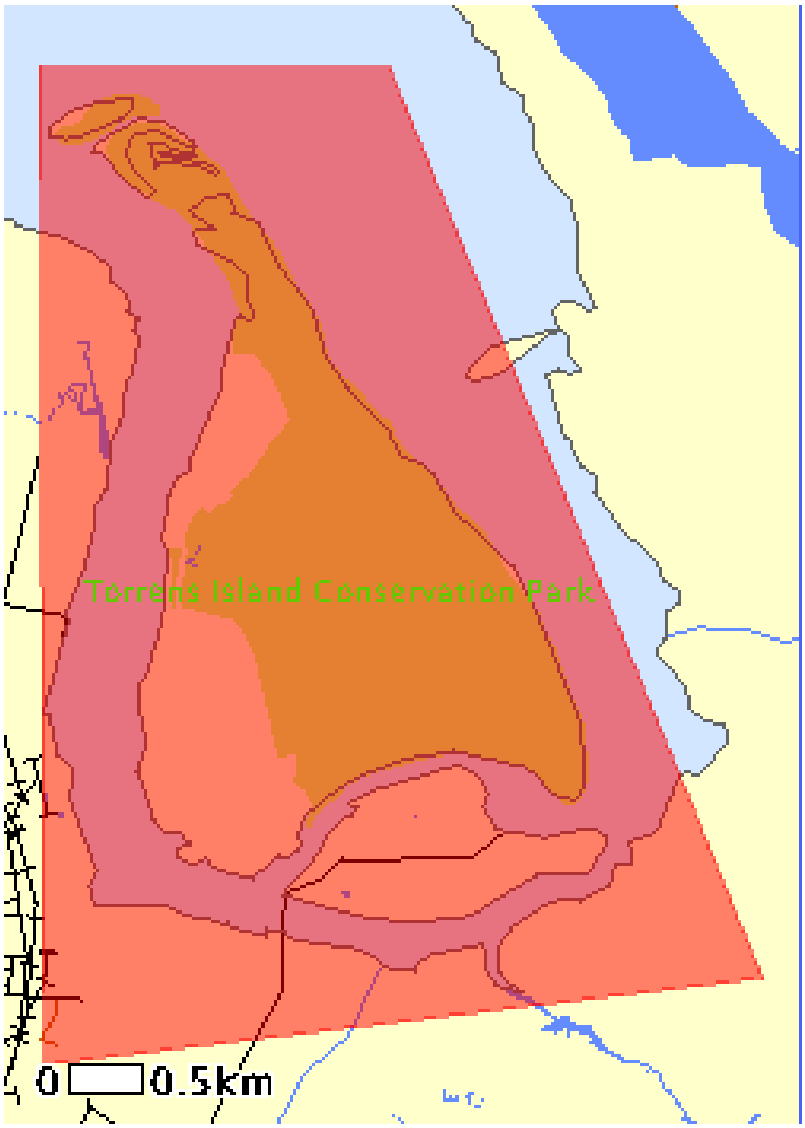

Figure 1. Search area (red) for *Environment Protection and Biodiversity Conservation Act 1999* database on matters of national environmental significance data extraction [1].

Biological Databases of South Australia (BDSA, Department for Environment and Heritage) data extraction

Listed flora and fauna species within specified coordinates, the area searched included Torrens Island, Garden Island, Port River, Angas Inlet, North Arm and Barker Inlet and was bounded by the following coordinates: -34.8401º, 138.5500º; -34.6386º, 138.5414º; -34.6586º, 138.4314º; -34.8086º, 138.6014º. Records extracted are either survey records (data collected at native vegetation and vertebrate survey sites in South Australia for which the majority of the information held has been collected according to the standardised Biological Survey of SA methodology) or opportune sightings (usually the result of casual observations rather than derived from a defined methodology or repeat visits) [2]. Where provided observer and surveyor name have been provided in the present report.

For flora 87 records were listed for the study area and land allotments adjacent the study area. Of all the records 88% were survey records (D. G. Fotheringham, Tidal and Salt Marsh Communities) and 22% were opportune sightings (State Herbarium of SA). For reptiles 28 records and 8 species were listed for Torrens Island but not the study area. All records were opportune observations made in 1984 and 1980 between September and December (SAM, SA Museum Vertebrate Data). For birds 1598 records for Torrens Island were listed, the majority of which were opportune observations [2].

Birdata Search Engine custom search

The search amalgamated all surveys from all sites within a specified area which included Torrens Island, Garden Island, Port River, Angas Inlet, North Arm and Barker Inlet (Fig. 2). 118 species of bird from 46 surveys conducted between 1999 and 2008 [3].

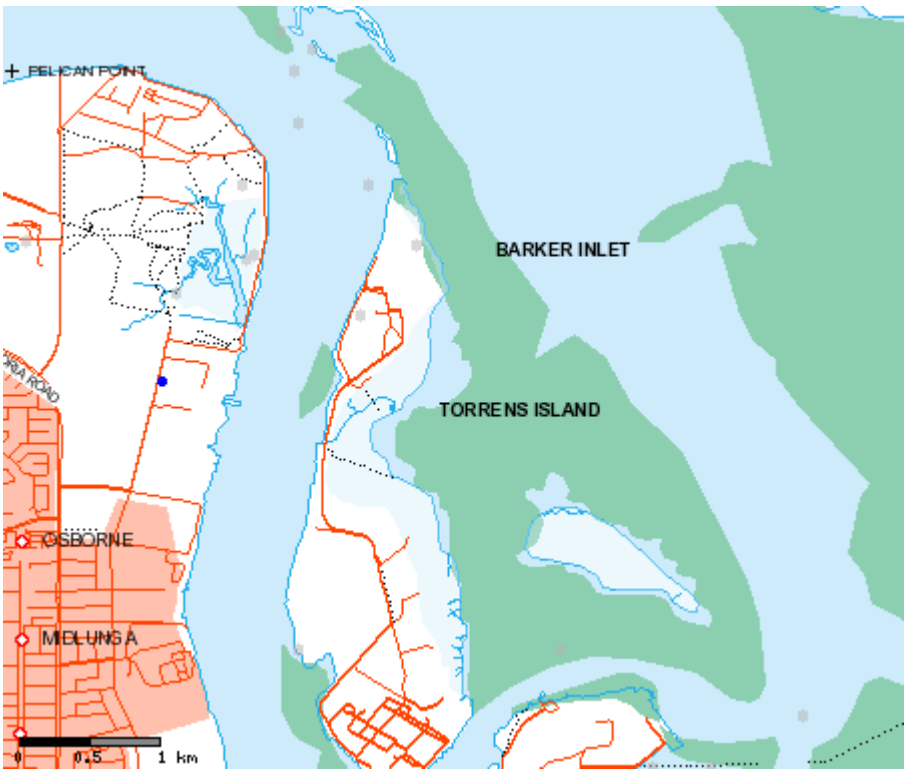

Figure 2. Birdata Search Engine custom search area [3].

Other information

Environmental Studies, Proposed Coal Conversion of Torrens Island, Section 5, The Existing Biological Environment (1986), Electricity Trust of South Australia (ETSA)

ETSA carried out extensive surveys of its Torrens Island property during 1983 and 1984 however methodologies were unobtainable. The authors of the report confirmed species identifications with the State Herbarium of SA. Species and vegetation communities were well documented and the report described nine vegetation communities, six of which occurred in the study area. For reptiles and mammals species lists and brief habitat associations for ETSA land were given. No methodology is provided, however, method of capture is indicated in results (pitfall traps, scat sightings, Elliot traps). Reference is made to bat trapping in addition to the use of ultrasonic listening equipment. A species list of birds was recorded in South Australian mangrove and samphire areas and which have positively been identified during studies on ETSA land [4].

A Vegetation Survey of Barker Inlet Gulf St Vincent South Australia (1994), Coastal Management Branch, Department of Environment and Heritage (DEH).

The report is a background document prepared for a management plan for Barker Inlet, Adelaide SA. Methodology, species and vegetation communities were well documented for Torrens Island and the surrounding Barker Inlet and Port River. The results from this study were mapped by the DEH in 1994. Flora species and vegetation communities were well documented for Torrens Island and the surrounding Barker Inlet and Port River. The results from this study were mapped by the DEH in 1994 [5].

Torrens Island Conservation Project (1997), report prepared for TIPS Electricity by Earth Sanctuaries Limited

The report was carried out to investigate The Torrens Island Conservation Project which would have involved the controlled release and management of native animals on Torrens Island on the land beyond the power station perimeter and the incorporation of all land on Torrens Island outside of the immediate ETSA Power Station and Quarantine Power Station areas under the management of the said project. The report provides a good description of flora in southern Torrens Island. No methodology was provided. Species lists for reptiles, mammals and birds were provided but no methodology. The species lists were from surveys conducted on ETSA land [6].

Wasleys to Adelaide Pipeline Looping Project supplement to the Environmental Impact Statement (1985), report prepared for Pipelines Authority of South Australia by Kinhill Stearns

The report provided a useful description of vegetation communities. No methodology was provided [7].

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APPENDIX 1

Appendix 2: Definitions of classifications used to assess conservation significance of native flora and fauna

Table 1. Description of conservation status classifications for species listed at national (N), state (S) and regional (R) level present or that may be present in the study area.

Status	Description
National (N). Listed under the *Environmental Protection and Conservation Act 1999* [1]	
CE = Critically Endangered.	Species is facing extremely high risk of extinction in the wild in the immediate future
E = Endangered	Species is not critically endangered, but is facing a very high risk of extinction in the wild in the near future.
V = Vulnerable	Species is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium-term future.
Migratory	Matters of national environmental significance under the EPBC Act (animals that migrate to Australia and its external territories or pass through or over Australia waters during their annual migrations) [2].
Listed Marine Species	The right and responsibility of Australia under the United Nations Convention of the Law of the Sea, Australian Government used the EPBC ACT to protect and manage marine species [3].
State (S). Listed under the South Australia *National Parks and Wildlife Act 1972* [4]	
E = Endangered	Taxa that are likely to become extinct in SA unless the circumstances and factors threatening their abundance, survival or evolutionary development cease to operate.
V = Vulnerable	Taxa that are likely to move into the Endangered category in SA in the near future unless the circumstances and factors threatening their abundance, survival or evolutionary development cease to operate.
R = Rare	Taxa that occur in small populations in South Australia, that are not at present endangered or vulnerable but are at some risk due to their low numbers. These taxa are usually localised within restricted geographical areas or are thinly scattered over a more extensive range. This may include taxa which are perceived to be at risk for which there is insufficient information available to assign them to any other category, and taxa that are considered to be dependent on ongoing conservation programs to prevent them moving into the endangered or vulnerable categories. Populations of rare taxa in SA may be contiguous with populations interstate that are considered to be secure. The rare category does not include taxa that are considered to be vagrants in South Australia.

continued

Status	Description
Regional (R)	
AMLR. Flora. Unofficial interim regional conservation rating as part of the Regional Recovery Plan for Threatened Species and Ecological Communities of Adelaide and the Mount Lofty Ranges, South Australia [5]	
E = Endangered	Scarce and in danger of becoming extinct in the wild.
T = Threatened	Likely to be either Endangered or Vulnerable but insufficient information exists for a more precise assessment.
V = Vulnerable	Rare and at risk from potential threats or long-term threats which could cause the species to become Endangered in the future
R = Rare	Has a low overall frequency of occurrence (may be locally common with a very restricted distribution or may be scattered sparsely over a wider area). Not currently exposed to significant threats, but warrants monitoring and protective measures to prevent reduction of population sizes.
AMLR. Fauna. Based on Carpenter and Reid (1987) [6] and updated in 1999 and revised with expert input in 2007 [5]	
E = Endangered	In danger of becoming extinct in the wild in the immediate future given current trends in populations and reasons for decline
V = Vulnerable	Likely to become Endangered in the immediate future given current trends in populations and reasons for decline
R = Rare	At risk due to low numbers of individuals even though no or little decline in distribution has been detected
U = Uncommon	Animals or vegetation types which are inadequately conserved or declining but are not yet sufficiently threatened to be listed as rare
Birds. International bilateral migratory bird agreements for terrestrial, water and shorebird species which migrate between Australia and China (CAMBA) and Japan (JAMBA) [7].	
C. CAMBA	Listed under China-Australia Migratory Bird Agreement [8].
J. JAMBA	Listed under Japan-Australia Migratory Bird Agreement [9].

APPENDIX 2

References

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4. *South Australia National Parks and Wildlife Act 1972 Version 21.2.2008*, Government of South Australia. Available at http://www.legislation.sa.gov.au.
5. Willson, A. and J. Bignall, *Regional Recovery Plan for Threatened Species and Ecological Communities of the Adelaide and the Mount Lofty Ranges, South Australia 2009 - 2014 Appendice PART B*. 2009, Department of Environment and Heritage, South Australia. Available at http://www.environment.sa.gov.au/biodiversity/pdfs/regional_recovery/flora_intro_information_fields.pdf. Accessed 12 September 2009
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7. *Bilateral migratory bird agreements*, Department of the Environment, Water, Heritage and the Arts, Australian Government. Available at http://www.environment.gov.au/biodiversity/migratory/waterbirds/bilateral.html.
8. *Australian Treaty Series 1988 No 22, Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment*, Commonwealth of Australia. Available at http://www.austlii.edu.au/au/other/dfat/treaties/1988/22.html.
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APPENDIX 2

Appendix 3: Definitions of classifications used to assess exotic flora and fauna

Description of classifications for exotic flora listed at national, state and regional levels present or likely to be present in the study area.

National (N). Weeds of National Significance (WONS) [1]

National effort against Australia's worst invasive plants that have degraded large portions of Australia's natural and productive landscape and require action at a national level to reduce their impacts [1].

State (S). *Natural Resources Management Act, 2004* [2]

Declared plants under the Act are significant weeds threats to the State's primary production industries, natural environments and public safety [3]

Notes:

* = Control required in part of the State only (trade and movement usually restricted throughout the State), landowners are required to take action and destroy or control plant [2]

[n] = Notifiable throughout the State, the presence and locations must be reported to the local NRM group or regional NRM board [2]

Regional (R). AMLR

Weeds pose a moderate to high threat in Coastal Vegetation, part of the Regional Recovery Plan for Threatened Species and Ecological Communities of Adelaide and the Mount Lofty Ranges, South Australia [4].

Note:

[1] = Weeds is considered a high regional priority [4].

Description of classifications for exotic fauna listed at national, state and regional levels present or likely to be present in the study area.

National (N)

Listed key threatening process under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) [5].

An threatening process that threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community[5].

State (S)

Documented pest and control strategies exists [6] .

APPENDIX 3

References

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3. *Declared plants of South Australia*, Government of South Australia. Available at http://www.dwlbc.sa.gov.au/assets/files/Declared_plants_of_SA_brochure.pdf.
4. Willson, A. and J. Bignall, *Regional Recovery Plan for Threatened Species and Ecological Communities of the Adelaide and the Mount Lofty Ranges, South Australia 2009 - 2014 Appendices PART A*. 2009, Department of Environment and Heritage, South Australia. Available at http://www.environment.sa.gov.au/biodiversity/pdfs/amlrrp-plan-appendixA.pdf. Accessed 12 September 2009
5. *Key threatening processes under the Environment Protection Biodiversity Conservation Act*, Department of the Environment, Water, Heritage and the Arts. Available at http://www.environment.gov.au/biodiversity/threatened/ktp.html.
6. *Animal Control Strategy Projects*, Department of Water, Land and Biodiversity Conservation, Government of South Australia. Available from http://www.dwlbc.sa.gov.au/biodiversity/apc/projects/animals/index.html.

Appendix 4: Native flora species present in the study area and adjacent areas

Table 1. Native flora species present in the study area. National (N), state (S) and regional (R) classifications are provided (see Table 1, Appendix 2 for definitions of classifications used to assess conservation significance). Presence in the shoreline, salt marsh and sand dune ecological communities and respective land allotments is indicated. In addition, presence in adjacent land allotments in the salt marsh ecological community and respective land allotments is indicated.

						Study area			Adjacent study area				
						Shoreline	Salt marsh	Sand dune	Salt marsh				
						303	303	303, 302, 805	605	605	605	605	402
Family	Species name	Common name	N	S	R				a	b	c	d	e
Cupressaceae	*Callitris gracilis*	Southern Cypress Pine											X
Casuarinaceae	*Allocasuarina verticillata*	Drooping Sheoak						X					X
Polygonaceae	*Muehlenbeckia gunnii*	Coastal Lignum						X					
Sapinaceae	*Dodonaea viscosa augustissima*	Sticky Hop-bush						X					
Aizoaceae	*Disphyma crassifolium*	Round-Leaved Pigface						X	X		X		
Aizoaceae	*Tetragonia implexicoma*	Bower Spinach						X					
Portulacaceae	*Calandrinia eremaea*	Small Purslane									X		
Chenopodiaceae	*Atriplex paludosa*	Marsh Saltbush						X			X		
Chenopodiaceae	*Atriplex semibaccata*	Berry Saltbush							X				
Chenopodiaceae	*Enchylaena tomentosa*	Ruby Saltbush						X			X		
Chenopodiaceae	*Maireana oppositifolia*	Salt Bluebush or Heathy Bluebush							X		X		
Chenopodiaceae	*Rhagodia candolleana*	Seaberry Saltbush						X			X		
Chenopodiaceae	*Sarcocornia blackiana*	Thick-head Glasswort							X				
Chenopodiaceae	*Sarcocornia quinqueflora*	Glasswort or Beaded Glasswort				X	X		X	X	X		X
Chenopodiaceae	*Sclerostegia arbuscula*	Shrubby Glasswort				X	X		X		X		
Chenopodiaceae	*Suaeda australis*	Austral Seabite					X		X				

continued

						Study area			Adjacent study area				
						Shoreline	Salt marsh	Sand dune	Salt marsh				
						303	303	303, 302, 805	605	605	605	605	402
Family	Species name	Common name	N	S	R				a	b	c	d	e
Chenopodiaceae	*Tecticornia flabelliformis*		V	V	V					X			
Chenopodiaceae	*Tecticornia halocnemoides ssp.*	Grey Samphire							X	X			
Chenopodiaceae	*Tecticornia indica ssp.*								K				X
Chenopodiaceae	*Tecticornia indica bidens*												X
Chenopodiaceae	*Tecticornia indica leiostachya*	Brown-head Samphire											X
Chenopodiaceae	*Threlkeldia diffusa*	Coast Bonefruit				X		X			X		
Amaranthaceae	*Hemichroa pentandra*	Trailing Hemichroa							X		X		
Pittosporaceae	*Pittosporum angustifolium*							X					
Crassulaceae	*Crassula colorata*	Dense Crassula or Dense Stonecrop											X
Ranunculaceae	*Clematis microphylla*	Small-leaved clematis						X					
Leguminosae	*Acacia ligulata*	Umbrella Bush or Small Cooba						X					
Leguminosae	*Acacia paradoxa*	Kangaroo Thorn						X					
Leguminosae	*Acacia pycnantha*	Golden Wattle						X					X
Leguminosae	*Acacia longifolia sophorae*	Sallow Wattle						X					
Leguminosae	*Kennedia prostrata*	Running Postman											
Zygophyllaceae	*Nitraria billardierei*	Nitrebush						X					
Euphorbiaceae	*Adriana quadripartita*	Rare Bitterbush						X					
Sapindaceae	*Dodonaea viscosa spatulata*	Sticky Hop Bush						X					
Franeniaceae	*Frankenia pauciflora*	Common (or southern) Sea-heath							X		X		

continued

APPENDIX 4

						Study area			Adjacent study area				
						Shoreline	Salt marsh	Sand dune	Salt marsh				
						303	303	303, 302, 805	605	605	605	605	402
Family	Species name	Common name	N	S	R				a	b	c	d	e
Myrtaceae	*Melaleuca halmaturorum*	Salt Paperbark										X	
Thymelaeaceae	*Pimelea serpyllifolia*	Thyme riceflower						X					
Umbelliferae	*Apium annuum*								X				
Apocynaceae	*Alyxia buxifolia*	Sea Box						X					
Convolvulaceae	*Wilsonia humilis*	Silky Wilsonia					X		X				
Primulaceae	*Samolus repens*	Creeping Brookweed							X				
Avicenniaceae	*Avicennia marina var. resinifera*	Grey (or white) Mangrove				X							
Myoporaceae	*Myoporum insulare*	Common Boobialla						X					
Compositae (Asteraceae)	*Olearia axillaris*	Coast Daisy-hush						X					
Compositae (Asteraceae)	*Senecio sp. (laceratus)*	Grey-haired-like Pappus						X			X		
Malvaceae	*Lawrencia squamata*	Thorny (or fan-leaved) Lawrencia							X		X		
Juncaginaceae	*Triglochin centrocarpum*	Dwarf Arrowgrass							X				X
Juncaginaceae	*Triglochin mucronata*	Prickly Arrowgrass											X
Juncaginaceae	*Triglochin striata*	Streaked Arrowgrass											X
Liliaceae	*Dianella revoluta*	Black-anther (or spreading) flax-lily						X					
Centrolepidaceae	*Centrolepis cephaloformis cephaloformis*	Cushion Centrolepis		R							X		X
Centrolepidaceae	*Centrolepis polygyna*	Wiry Centrolopis									X		X
Gramineae (Poaceae)	*Sporobolus virginicus*	Salt Couch							X		X		
Gramineae (Poaceae)	*Puccinellia stricta*	Australian Saltmarsh-grass							X		X		
Typhaceae	*Typha domingensis*							X					
Cyperaceae	*Ficinia nodosa*	Knobby Club-rush						X					X

APPENDIX 4

Appendix 5: Exotic flora species present in the study area and adjacent areas

Table 1. Exotic flora species present in the study area. National (N), state (S) and regional (R) classifications are provided (see Appendix 3 for definitions of classifications used to assess exotic flora). Presence in the shoreline, salt marsh and sand dune ecological communities and respective land allotments is indicated. In addition, presence in adjacent land allotments in the salt marsh ecological community and respective land allotments is indicated and presence of species in Torrens Island (TI) is indicated where no further information exists.

						Study area			Adjacent the study area					
						Shore-line	Salt marsh	Sand dune	Salt marsh					
						303	303	303, 302, 805	605	605	605	605	402	TI
Family	Species name	Common name	N	S	R				a	b	c	d	e	
Urticaceae	*Urtica urens*	Stinging Nettle												X
Caryophyllaceae	*Spergularia diandra*	Lesser (or Small Sand-spurrey											X	
Aizoaceae	*Carpobrotus edulis edulis*	Hottentot Fig			X			X						
Aizoaceae	*Galenia pubescens*	Coastal Galenia						X						
Aizoaceae	*Galenia secunda*													X
Aizoaceae	*Mesembryanthemum crystallinum*	Common Iceplant			X			X						
Aizoaceae	*Mesembryanthemum nodiflorum*	Slender Iceplant						X						
Chenopodiaceae	*Chenopodium glaucum*	Glaucous Goosefoot												X
Chenopodiaceae	*Suaeda baccifera*				X				X					
Cactaceae	*Opuntia monacantha*			X				X						
Cruciferae	*Cakile maritima*	Two-horned Sea-rocket				X		X						
Cruciferae	*Sisymbrium orientale*	Indian Hedge Mustard												X
Crassulaceae	*Cotyledon orbiculata var. oblonga*							X						
Leguminosae	*Medicago truncatula*	Barrel Medic												X
Leguminosae	*Trifolium arvense var. arvense*	Hare's-foot Clover												X
Leguminosae	*Trifolium glomeratum*	Burdock clover												X
Leguminosae	*Trifolium suffocatum*	Suffocated Clover												X
Oxalidaceae	*Oxalis pes-caprae*	Soursob		X*	X									X

continued

						Study area			Adjacent the study area					
						Shore-line	Salt marsh	Sand dune	Salt marsh					
						303	303	303, 302, 805	605	605	605	605	402	TI
Family	Species name	Common name	N	S	R				a	b	c	d	e	
Zygophyllaceae	*Tribulus terrestris*	Caltrop		X n										X
Euphorbiaceae	*Euphorbia terracina*	False Caper		X	X			X					X	X
Euphorbiaceae	*Ricinus communis*	Castor Oil Plant												X
Anacardiaceae	*Schinus molle var. areira*	Pepper-tree						X						
Cucurbitaceae	*Ecballium elaterium*	Squirting Cucumber						X						
Cucurbitaceae	*Cucumis myriocarpus*	Paddy Melon												X
Onagraceae	*Oenothera stricta*	Common (or sweet-scented) Evening-primrose						X						
Primulaceae	*Anagallis arvensis*	Scarlet (or blue) Pimpernel						X						
Primulaceae	*Samolus repens*	Creeping Brookweed					X							
Limoniaceae	*Limonium campanyonis*								X		X		X	
Limoniaceae	*Limonium psilocladon syn.hyblaeum*												X	
Limoniaceae	*Limonium sinuatum*	Notch-leaved (or perennial) Sea-lavender												X
Ocealceae	*Olea europaea cuspidata*	Olive		X	X[1]			X						
Asclepiadaceae	*Gomophocarpus cancellatus*	Broad-leaved Cotton-bush						X						
Boraginaceae	*Heliotropium curassavicum*	Smooth Heliotrope												X
Labiatae	*Marrubium vulgare*	Horehound		X*										X
Solanaceae	*Lycium ferocissimum*	African Boxthorn		X*	X			X						
Solanaceae	*Nicotiana glauca*	Tree Tobacco						X					X	
Compositae (Asteraceae)	*Aster subulatus*	Wild aster or Aster-weed												X

continued

						Study area			Adjacent the study area					
						Shore-line	Salt marsh	Sand dune	Salt marsh					
						303	303	303, 302, 805	605	605	605	605	402	TI
Family	Species name	Common name	N	S	R				a	b	c	d	e	
Compositae (Asteraceae)	*Arctotheca calendula*	Capeweed												X
Compositae (Asteraceae)	*Conyza bonariensis*	Flaxleaf Fleabane												X
Compositae (Asteraceae)	*Cynara cardunculus flavescens*	Artichoke Thistle		X*				X						
Compositae (Asteraceae)	*Dittrichia graveolens*	Stinkwort						X						
Compositae (Asteraceae)	*Hedypnois rhagadioloides*	Cretan Weed												X
Compositae (Asteraceae)	*Hypochaeris glabra*	Smooth Catsear												X
Compositae (Asteraceae)	*Oncosiphon suffruticosum*	Calomba Daisy												X
Compositae (Asteraceae)	*Reichardia tingitana*	False Sow-thistle												X
Compositae (Asteraceae)	*Senecio pterophorus*	African Daisy						X						
Compositae (Asteraceae)	*Sonchus oleraceus*	Common Sow-thistle												X
Compositae (Asteraceae)	*Taraxacum officinale (NC)*	Dandelion												X
Juncaceae	*Juncus acutus*	Sharp (or spiny) Rush			X									X
Liliaceae	*Asparagus asparagoides*	Bridal Creeper	X	X	X									X
Liliaceae	*Asphodelus fistulosus*	Onion Weed		X*										X
Iridaceae	*Moraea setifolia*	Thread Iris												X
Gramineae (Poaceae)	*Ammophila arenaria*	Marram Grass												X
Gramineae (Poaceae)	*Avena barbata*	Bearded Oat												X
Gramineae (Poaceae)	*Avena sativa*	Cultivated Oat												X
Gramineae (Poaceae)	*Bromus catharticus*	Prarie Grass												X
Gramineae (Poaceae)	*Bromus diandrus*	Jabbers, Great Brome												X
Gramineae (Poaceae)	*Bromus hordeaceus ssp. hordeaceus*	Soft Brome												X
Gramineae (Poaceae)	*Bromus madritensis*	Madrid Brome or Lesser Brome												X

continued

						Study area			Adjacent the study area					
						Shore-line	Salt marsh	Sand dune	Salt marsh					
						303	303	303, 302, 805	605	605	605	605	402	TI
Family	Species name	Common name	N	S	R				a	b	c	d	e	
Gramineae (Poaceae)	*Cortaderia selloana*	Pampas Grass												X
Gramineae (Poaceae)	*Cynodon dactylon*	Couch-grass						X						
Gramineae (Poaceae)	*Digitaria sanguinalis*	Crab Grass												X
Gramineae (Poaceae)	*Ehrharta villosa var. maxima*	Pyp Grass			X									X
Gramineae (Poaceae)	*Ehrharta longiflora*	Annual Veldt Grass												X
Gramineae (Poaceae)	*Hordeum glaucum*	Northern Barley-grass												X
Gramineae (Poaceae)	*Hordeum leporinum*	Barley-grass or Common Foxtail												X
Gramineae (Poaceae)	*Hordeum marinum*	Sea Barley												X
Gramineae (Poaceae)	*Lagurus ovatus*	Hares Tail Grass												X
Gramineae (Poaceae)	*Lamarckia aurea*	Golden-top or Comb Grass												X
Gramineae (Poaceae)	*Lolium perenne X Lolium rigidum*	Perennial Ryegrass												X
Gramineae (Poaceae)	*Parapholis incurva*	Curley Ryegrass								X		X		
Gramineae (Poaceae)	*Periballia minuta*	Small Hair-grass												X
Gramineae (Poaceae)	*Poa annua*	Winter Grass												X
Gramineae (Poaceae)	*Polypogon maritimus*	Coast Beard-grass												X
Gramineae (Poaceae)	*Polypogon monspeliensis*	Annual Beard-grass												X
Gramineae (Poaceae)	*Puccinellia distans*	Reflexed Poa												X
Gramineae (Poaceae)	*Rostraria cristata*	Annual Cats Tail												X
Gramineae (Poaceae)	*Sagina apetala*	Common (or annual) Pearlwort												X
Gramineae (Poaceae)	*Schismus barbatus*	Arabian Grass												X
Gramineae (Poaceae)	*Vulpia fasciculata*	Sand Fescue												X
Cyperaceae	*Isolepis marginata*	Coarse club-rush												X

APPENDIX 5

Listed exotic flora species

See Appendix 3 for definitions of classifications used to assess exotic flora.

Weeds of national significance (WONS)

Asparagus asparagoides (Bridal Creeper)

The BDSA database extraction listed *A. asparagoides* just north of the Quarantine Power Station in a survey in 1997 (R. K. Sandercock and R. J. Ferguson, Coastal Dune and Clifftop) [1]. It was observed in Lot 303 in the site familiarisation visit. Conservation Volunteers Australia (CVA) reported that *A. asparagoides* exists in Torrens Island Sanctuary (TIS) and occurs in high numbers elsewhere on Torrens Island where it has displaced native creepers and shrubs, smothering them out [2].

A. asparagoides is a South African vine that has invaded native vegetation in most temperate or Mediterranean climates across Australia in including South Australia [3]. The primary source of spread is humans through the dumping of garden waste, movement of rhizomes by earthmoving equipment and casual swapping of plant material [3]. Seed is spread by birds, rabbits and foxes whom consume the fruit in later winter and spring, each berry may only contain four to six seeds but the plant is capable of producing 10 000 seeds per square metre and once germinated can grow up to three metres in height [3]. The plant can also spread as the root system expands. The plant smothers native vegetation and creates a physical barrier in the soil through its underground tuber mat, it also changes the chemical composition of the soil, inhibiting germination of native species and allowing other introduced species to invade (particularly grass weeds) [3]. It poses a major threat to most low shrubs and groundcover plants in mallee, dry scerophyll forest and heath vegetation [4].

A. asparagoides has annual climbing shoot growth from a perennial root system consisting of many tubers [4]. Twisting stems grow up to 3 m in length and numerous shoots produced from one patch of roots entwine with each other and native vegetation [4]. Seeds germinate in autumn and winter and shoots generally emerge in autumn [4].

Its tuber makes *A. asparagoides* difficult to control and unlike some other weeds can invade undisturbed sites [4]. It does, however, have a relatively short-lived seedbank, see production only occurs on early emerging stems, and the seed output in old infestations is small [4]. In 2000 a national biocontrol program began using three agents: a rust, a leafhopper and a leaf beetle [3]. The rust fungus have been the most successful, reducing dense walls of *A. asparagoides* to insignificant plants in Western Australia and South Australia [3]. The leafhopper has proved effective in coastal regions, producing heavy localised damage [3]. Herbicides have been the effective method of control, however, in area of native vegetation is not desirable [4]. Physical removal is not effective unless all the rhizomes are dug up and destroyed but may be possible for small infestations or as a follow-up after several years of herbicide control [4]

During 1998 CVA surveyed *A. asparagoides* over nine days and obtained and released *A. asparagoides* biological control at two sites in the TIS in the period August to October 2003 [2].

Declared plants under the South Australia *Natural Resources Management Act, 2004*

The Control Strategies Group (Department of Water, Land and Biodiversity Conservation, Government of South Australia) is involved in developing and revising proclaimed plant policies, with research into the ecology of pest plants and the development of a weed risk assessment system assisting in advancing control strategies and acting as a basis for these policies [5]. Primary Industries and Resources SA provide fact sheets for a number of problem weeds [6] and the CRC for Australian Weed Management also provide weed management guides for weeds [7]. CVA have been involved with weed control on Torrens Island, particularly within the TIC, since 1992 and have targeted specific weeds and implemented several control strategies [8].

Lyceum ferocissimum (African Boxthorn) - Very common in coastal areas, the African Boxthorn forms dense impenetrable thickets that is excellent habitat for feral mammals such as foxes and rabbits [6]. The boxthorn also invades native vegetation after disturbance [6]. Seeds germinate at any time of the year and are competitive with other shrub species [6]. The boxthorn is difficult to destroy because of its large size, thorns and capacity to regrow vigorously from the roots or stumps and is spread by its seed [7]. Methods of control include physical weed removal, chemical control, foliar spraying, cut-stump application, stem injection and basal bark application [7]. African Boxthorn has been targeted by CVA for removal that has dug it up, cut and swab plants, and used herbicides [8].

Marrubium vulgare (Horehound) - Initially horehound occupies roadsides, channel banks and rabbit warrens from which it encroaches into bush land, it is not invasive in undisturbed native vegetation [7]. Horehound is spread by seed [7]. Methods of control include hand-pulling, slashing, cultivation, chemical control, burning, biological control, grazing by sheep and rabbits and reseeding [7].

Asphodelus fistulosus (Onion Weed) - Onion weed occurs on roadsides and undisturbed areas and cause yield reductions in crops and pastures due to competition from established plants [9]. It is difficult to control once established [9]. Chemical control is the suggested method of control [9].

Oxalis pes-caprae (Soursob) - Soursob is a herb that reproduces from bulbs and bulbils and is mainly spread in contaminated soil [10]. Dense soursob infestations can seriously compete with native plants [10].

Cynara cardunculus flavescens (Artichoke Thistle) - Occurs in poorer pastures and neglected areas, there are dense infestations north and south of Adelaide [11]. Spread is almost entirely by seed that are dispersed by wind in addition to sheep, cattle, water, mud, birds and mice [11]. Methods of control include grubbing of scattered plants and herbicides [11]. Artichoke Thistle has been targeted by CVA for removal who have dug it up and used herbicides, the spray being the more successful of the two removal methods [8].

Tribulus terrestris (Caltrop) - The burrs of caltrop can damage the feet of animals and injure humans and they are a particular nuisance in amenity areas like parks [6]. Caltrop may chemically inhibit the growth of some native plants [6]. Caltrop will grow in almost any soil type and is mainly spread by

seed through animals, humans and machinery [6]. Caltrop has been targeted by CVA for removal [8].

Euphorbia terracina (False Caper) - False cape is an erect perennial herb that spreads from the movement of soil and road building material contaminated with seed and over longer distance spreads with water along streams and channels and in mud adhering to animals and vehicles [12]. False Caper has been targeted by CVA for removal [8].

Olea europaea (Olive) - Olives are an invader of native vegetations and adjoining cleared, ungrazed land and if uncontrolled can alter the composition, decrease biodiversity and increase the fire hazard of native vegetation [7]. The spread of olives is mainly due to birds and foxes eating the fruit and dropping the seeds elsewhere [7]. The Olive Tree has been targeted by CVA for removal who have cut and swab plants, dug up plants and used chainsaws to remove plants [8].

Additional species regionally as a moderate to high threat in coastal vegetation in the AMLR

Suaeda baccifera – Occurs as a sprawling annual with succulent leaves on highly saline sites [13].

Mesembryanthemum crystallinum (Common Iceplant) - The Common Iceplant is a succulent herbs that has established in disturbed and saline area across southern Australia [14]. The species is a salt accumulator and after plant death salt leaches from the decaying plant into the surrounding soil and this increased salinity stops other less salt-tolerant species from establishing [14].

Carpobrotus edulis edulis (Hottentot Fig) - Introduced Hottentot Fig is a threat to native vegetation and one concern is that it may be hybridizing with native Carpobrotus rossii reducing its genetic impurity [15]. It invades and displaces native plant communities by forming dense mats that cover the ground, smothering native species and destroying coastal habitat in its path [15]. It is a hardy plant that can resist herbivores and rigorous competition. Spread is vegetative and by seed [15].

Ehrharta villosa var. maxima (Pyp Grass) - Pyp Grass has long, creeping rhizomes and commonly grows as a dense sward displacing most other spaces and in some cases even scrambling over shrubs up to 2 to 3 meters in height [16].

Juncus acutus (Sharp Rush) - Spiny Rush is a large touch weeds that is spread by seed and much of the spread appears to be by seed contaminated mud attached to vehicles and animals [11]. The suggested control method is herbicide [11].

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Appendix 6: Salt marsh communities adjacent the study area

For species identified in each community see Table 1, Appendices 4 and 5.

a) *Maireana oppositifolia* dense low heath to open dwarf scrub is a salt marsh community that occurs in Lot 605 on chenier ridges and along the margins of the beach ridges, dunes and levee banks [1]. The community has a dominant overstorey of *Maireana oppositifolia* and is codminated by *Sclerostegia arbuscula* and occasionally *Tecticornia indica ssp.* and *Lawrencia squamata* with an average percent cover of 82.6% [1]. Average shrub height is 38.7 cm and average site elevation is 0.81 m (AHD) [1].

b) *Tecticornia halocnemoides ssp.* / *Tecticornia flabelliformis* low heath to open dwarf scrub is a salt marsh community that occurs along the eastern margin of Lot 303 in Lot 605 [1]. These stories do not occur exclusively together but when they do *T. halocnemoides ssp.* forms the overstorey. An isolated patch of *T. flabelliformis* occurs in Lot 605 [1]. Average site elevation is 1.12 m (AHD) [1]. T. *flabelliformis* has been observed to dies back and lose all its foliage in winter, regenerating again in spring [1] The community forms a very spares to mid dense vegetation cover (18.9 % average percent cover and average shrub height 8.3 cm) often restricted to the edges of salt scalds [1]. *T. halocnemoides ssp.* is widespread however *T. flabelliformis* has a restricted distribution occurring in small populations on Torrens Island, St Kilda and north of St Kilda [1].

c) *Atriplex paludosa* dwarf to open dwarf scrub occurs in Lot 605 in association with the *Maireana oppositifolia* dense low heath to open dwarf scrub community along levees, chenier and beach ridges and along the margins of dunes [1]. The community occurs in high parts of the salt marsh (average site elevation is 1.63 m (AHD)) elevated above the reach of tidal flooding but not the occasional storm assisted tides [1]. *Lawrencia squamata*, *Maireana oppositifolia* and *Sclerostegia arbuscula* often codominate the community with *Atriplex paludosa* (average percent cover is 51% and average shrub height is 47 cm) [1]. The community has the highest species diversity of any of the salt marsh communities due to a variety of non halophyte grass and herb annuals [1].

d) *Melaleuca halmaturorum* open tree mallee community occurs in an isolated patch Lot 402 [1]. The community comprises only a few trees that occur on elevated land (average site elevation 1.8 m (AHD)) at the back of the saltmarsh [1].

e) Immediately adjacent the eastern margin of Lot 303 in Lot 605 is a 7 hectare linear patch of *Sarcocornia quinqueflora* low heath referred to as reclaimed and disturbed tidal habitat [1]. [2] refers to this community as dune sedge land. Not occurring elsewhere in the greater Torrens Island region this community has established within sand pits excavated on Torrens Island in 1989 which are landscaped to facilitate salt marsh although in places the sedge *Isolepis marginata* forms a mid dense to dense layer and clumps of *Acacia pycnantha* form open tree mallee overlying a sparse to very sparse shrub layer [1]. *Callitris gracilis* and *Allocasuarina verticillata* comprise a small area of low woodland [1]. A few of the exotic species *Nicotiana glauca* occur and the exotic *Euphorbia*

terracina is widely dispersed [2]. At the north western edge of this community is an isolated clay pan containing a dwarf plant community dominated by *Centrolepis cephaloformis cephaloformis*, a plant of limited distribution, *Triglochin* sp., *Tecticornia* sp. and exotic *Limonium* sp [2, 3]. [3] considered this community as worthy of conservation.

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APPENDIX 6

Appendix 7: Threatened flora and species of conservation significance that are occur adjacent to the study area

Tecticornia flabelliformis – Vulnerable under *Environment Protection and Biodiversity Conservation Act 1999*

Also known as Bead Glasswort, *T. flabelliformis* has been identified outside of the study area in Lot 605 primarily within salt marsh community (b) [1]. The Biological Databases of South Australia (BDSA, Department for Environment and Heritage (DEH)) data extraction listed 12 records for *T. flabelliformis*. Six records were collected at survey sites in 1989 and 1990 (D. G. Fotheringham, Tidal and Salt Marsh Communities), two records were opportune sightings in 1981 and 1980 (State Herbarium of SA) and two records are classified as threatened plant population data (D. G. Fotheringham) [2]. Given that the distribution of *T. flabelliformis* on Torrens Island is generally restricted to one habitat type that is not in the study area, it is unlikely that *T. flabelliformis* occurs in the study area.

T. flabelliformis is a woody, perennial, salt-tolerant plant growing up to 20 cm high in saltmarshes associated with salt lakes and saline flats. The distribution of *T. flabelliformis* is listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*, due to its restricted populations in South Australia, Victoria and Western Australia, with the majority of populations occurring in South Australia [3]. However, *T. flabelliformis* is currently under review for removal from the *Environment Protection and Biodiversity Conservation Act 1999* listed species (Rickabee, C. EPBC Listing officer, Department of the Environment, Water, Heritage and the Arts, Canberra, Australia, Canberra, Australian Capital Territory. Telephone conversation. 17 June 2009, CNS).

T. flabelliformis is found in salt marshes and samphire flats, usually on salt lake foreshores and saline flats. This species requires a highly specific habitat and usually restricted to areas of low ground or depressions that are seasonally inundated. Within South Australia specimens have been recorded on the Eyre and Yorke Peninsula, and upper Fleurieu Peninsula, including Garden and Torrens Island [4]. Climate change and weed invasion are considered the most serious threat to the *T. flabelliformis* [5] in South Australia, however building developments, stock grazing and vehicle disturbance are also considered a serious threat to remaining populations [3].

Centrolepis cephaloformis cephaloformis (Cushion Centrolepis) – Rare under the *National Parks and Wildlife Act 1972*

C. cephaloformis cephaloformis was identified at the north western edge of salt marsh community (e) *Sarcocornia quinqueflora* low heath in Lot 605, adjacent to the study area [7]. The BDSA database extraction listed four records for *C. cephaloformis cephaloformis* in salt marsh community (c) *Atriplex paludosa* dwarf to open dwarf scrub in Lot 605 [2]. The BDSA records comprised three survey records from 1990 (D. G. Fotheringham, Tidal and Salt Marsh Communities) and one opportune records from 1984 (State Herbarium of SA) [2]. According to [1], *Centrolepis cephaloformis* ssp. *cephaloformis*

is associated with *A. paludosa* low heath on dune sands and it is a small tussock-like plant. It has a limited distribution and therefore its occurrence on Torrens Island represents a significant new record [7]. [8] suggested this locality would be worthy of conservation. Given the absence of the *A. paludosa* community in the study area *C. cephaloformis cephaloformis* is unlikely to be present in the study area.

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APPENDIX 7

Appendix 8: *Adriana quadripartita* (Rare Bitterbush) and the butterfly *Theclinesthes albocincta* (Bitter-bush blue)

A. quadripartita (Rare Bitterbush)

Adriana quadripartita (Rare Bitterbush), also known as *A. klotzschii* has been identified uncommon in the Southern Lofty Region (SLR) [1, 2]. *A.quadripartita* communities have been identified in the south east corner of Lot 303 and in Lot 805 in an 8 hectare remnant [3, 4]. The Biological Databases of South Australia (BDSA, Department for Environment and Heritage (DEH)) data extraction listed three records for *A.quadripartita* [5]. One survey record in 1997 identified it just north of the Quarantine Power Station (R. K. Sandercock and R. J. Ferguson, Coastal Dune and Clifftop) [5]. One opportune record identified it just north of the north western end of salt marsh community (e) *Sarcocornia quinqueflora* low heath and another opportune record identified it in the salt marsh vegetation east of the study area and adjacent land allotments (State Herbarium of South Australia) [5]. *A.quadripartita* usually occurs in coastal and near coastal sand dune systems [6]. In 2008 Conservation Volunteers Australia (CVA) mapped locations of *A.quadripartita* on Torrens Island [7] (Figure 9 of report and Table 1).

Once one of the more common plants along the Adelaide metropolitan coastline [10], *A.quadripartita* is presently threatened in Adelaide due to the loss of habitat for urbanisation and agriculture, the biggest threat to *A.quadripartita* being coastal housing developments [6, 11].

Relationship between *A. quadripartita* and *T. albocinta*

A.quadripartita has received considerable attention as the host plant of the butterfly *Theclinesthes albocincta* (Bitter-bush Blue) [6, 8]. The larvae of *T. albocincta* exist solely on *A. quadripartita* and not surprisingly the butterfly only occurs in coastal regions of South Australia [6]. *T. albocincta* does not have a national conservation status and is not considered threatened on a large scale [9]. However, municipal populations may be threatened in South Australia by the loss of *A. quadripartita* [9]. *T. albocincta* has been classified as locally common in South Australia by [6]. It has been reported that the population of *T. albocincta* has been reduced to three isolated populations, one at Torrens Island and the other one at Normanville [4, 10]. [4] documented three populations within the Fleurieu Peninsula region associated with patches of remnant *A.quadripartita*; Torrens Island, Port Gawler and Newland Head. They concluded through genetic analysis that the populations suffer from reduced genetic diversity as a result of their size and isolation and the Newland Head population is nearing extinction [4].

The larvae of *T. albocincta* exist solely on *A. quadripartita* and not surprisingly the butterfly only occurs in coastal regions of South Australia [6]. Adults of *T. albocincta* normally fly close to the host plant and males attempt to establish territories on the host plant from where they fend off other males or fly to adjacent host plants to look for unfertilised females [6]. Females can be observed flying near the host plants searching for a place to lay eggs [6]. *A. quadripartita* are dioecious (separate male and female plants) and although larvae will eat all fleshy parts of the plants they prefer the flowering heads of

the male plants which are more common during the spring [6]. The presence of larvae is often discernible by the presence of ants which attend or at least are harmlessly association with the larvae, feeding from the nectary glands [6]. The most common flight period in South Australia is during spring to autumn [6]. Flight is reasonably fast, but of short duration, and both sexes can be approached with ease when settled [6].

Taxonomy

T. albocincta belongs to a genus comprising of species still in the active process of speciation where each species has evolved on specific larval hosts in often specialised niches [6]. Even within *T. albocincta* there is still active speciation between the coastal blue form from South Australia (Bitter-bush Blue), coastal and near coastal form from Queensland and New South Wales, purple form from Western Australia and inland brown form from inland Australia [6]. The stage at which a geographical form of a butterfly should be recognised as a subspecies and at what stage a subspecies should be recognised a distinct species is currently being debated among taxonomy experts [6]. Consequently, *T. albocincta*, the Bitter-bush Blue, could eventually be promoted to species which would increase its leverage in gaining conservation status.

Threatening processes

Away from urban areas *A.quadripartita* is widespread and locally common in coastal habitat [6]. Once one of the more common plants along the Adelaide metropolitan coastline [10], *A.quadripartita* is presently only threatened in Adelaide due to the loss of habitat for urbanisation and agriculture, the biggest threat to *A.quadripartita* being removal for coastal housing developments [6, 11]. An additional threat is the excessive use of groundwater for agricultural purposes and the continuing worldwide slow rise in sea level due to global warming [6]. *A.quadripartita* usually occurs in coastal and near coastal sand dune systems [6]. It used to occur in the eastern Flinders Ranges extending to the Olary Regions but is now virtually absent in these locations [6].

Mitigation and conservation attempts

Coastal management policies have already recognised the dependence of the butterfly on *A.quadripartita* [6]. The Semaphore Park Coastcare Group in conjunction with the City of Charles Sturt have revegetated several sites in the Semaphore Park Coastal Reserve with *A.quadripartita* with the objective increase the abundance of *T. albocincta* [10]. The same council has also recommended that *A.quadripartita* continues to be included in revegetation works to assist in the creation of a corridor for *T. albocincta* [1, 2]. Butterfly Conservation South Australia (BCSA) received a grant in 2003 to propagate *A.quadripartita* for planting in the hind dune areas from Outer Harbour to Normanville with the aim of creating a coastal corridor for *T. albocincta* [10]. By 2005 four planting sites had been established as part of this grant [1]. The population at Torrens Island is restricted due to the power stations and unpublished survey data has shown that the disturbed section of the island from the construction of one of the pipelines has revegetated naturally from the seed bank and is now mainly composed of *A. quadripartita* [4]. South East Australia (SEA) Gas who constructed a pipeline traversing the study area on Torrens Island, as part of their mitigation procedures in addition to site

restoration actives committed to significant net gain offset projects away from pipeline easement, contributing towards the protection, restoration and biodiversity improvements, and sponsorship of research into the Bitter-blue Butterfly was one such offset [12]. In April 2003 CVA collected seeds of *A.quadripartita* for several rounds of planting [13], whether these planting eventuated is undocumented.

Table 1. Locations of ***Adriana quadripartita*** (Rare Bitterbush) mapped by Conservation Volunteers Australia (CVA), 2008 (table provided by Rychard Oleszczyk, AGL TIPS).

Id number	Longitude	Latitude	Other information
1	34°47.844'S	138°31.261'E	
2	34°47.839'S	138°31.264'E	
3	34°47.840'S	138°31.254'E	
4	34°47.840'S	138°31.251'E	
5	34°47.840'S	138°31.233'E	
6	34°47.847'S	138°31.238'E	
7	34°47.845'S	138°31.236'E	
8/9	34°47.845'S	138°31.258'E	2 close together?
10/11	34°47.850'S	138°31.256'E	2 close together?
12	34°47.861'S	138°31.259'E	Approx 100 plants in a 20m radius
13	34°47.853.S	138°31.280'E	Approx 30 plants in 20m radius
14	34°47.884'S	138°31.257'E	2 plants
15	34°47.888'S	138°31.251'E	3 plants
16	34°47.891'S	138°31.239'E	13 plants in 15m radius
17	34°47.910'S	138°31.239'E	24 plants in 20m radius
18	34°47.928'S	138°31.269'E	21 plants in 20m radius
19	34°47.939'S	138°31.263'E	26 plants in 20m radius
20	34°47.931' S	138°31.284'E	
21	34°47.924'S	138°31.292'E	4 plants in 5m radius
22	34°47.920'S	138°31.301'E	9 plants in 5m radius
23	34°47.922'S	138°31.309'E	
24	34°47.917'S	138°31.314'E	7 plants in 5m radius
25	34°47.908'S	138°31.307'E	13 plants in 7m radius
26	34°47.899'S	138°31.303'E	8 plants in 5m radius
27	34°47.893'S	138°31.311'E	11 plants in 15m radius
28	34°47.880'S	138°31.319'E	8 plants in 5m radius
29	34°47.875'S	138°31.326'E	
30	34°47.853'S	138°31.294'E	6 plants in 5m radius
31	34°47.842'S	138°31.297'E	
32	34°47.841'S	138°31.295'E	
33	34°47.904'S	138°31.220'E	
34	34°47.947'S	138°31.249'E	
35	34°47.943'S	138°31.256'E	4 plants in 3m radius
36	34°47.959'S	138°31.315'E	
37	34°47.953'S	138°31.315'E	

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APPENDIX 8

Appendix 9: Amphibian species that may occur in the broader region

Table 1. Amphibian species that may occur in the study area. State (S) and regional (R) classifications are provided (see Table 1, Appendix 2 for definitions of classifications used to assess conservation significance of fauna).

Family	Scientific name	Common name	S	N
Hylidae	*Litoria ewingi*	Brown Tree Frog		
Leptodactylidae	*Crinia signifera*	Common Froglet		
Leptodactylidae	*Limnodynastes dumerilii*	Bull (Eastern Banjo) Frog		
Leptodactylidae	*Limnodynastes tasmaniensis*	Spotted Grass Frog		
Leptodactylidae	*Litoria raniformis*	Golden Bell Frog	V	
Leptodactylidae	*Neobatrachus pictus*	Painted Frog (Burrowing Frog)		
Leptodactylidae	*Pseudophryne bibroni*	Brown Toadlet	R	V

Appendix 10: Reptile species that are present in south Torrens Island and may occur in the study area

Table 1. Reptile species that have been identified in south Torrens Island (TI) and may occur in the study area. Regional (R) classifications are provided (see Table 1, Appendix 2 for definitions of classifications used to assess conservation significance of fauna).

Species name	Common name	R	South TI
Christinus marmoratus	Marble or Marbled Gekko		X
Diplodactylus vittatus	Eastern Stone Gecko		
Nephrurus milii	Barking Gecko		
Gehyra variegata	Tree Delta		
Aprasia inaurita	Red-tailed Worm-lizard		
Aprasia pseudopulchella	Flinders Worm-lizard		
Dipoldactylus intermedius	Spine-tailed Gekko		X
Underwoodisaurus milii	Thick-tailed Gekko or Barking Gekko		X
Aprasia striolata	Striped Legless Lizard or Striated Worm Lizard		X
Pygopus lepidopodus	Common Scaly-foot		
Ctenophorus pictus	Painted Dragon		X
Pogona barbata	Eastern Bearded Dragon		
Varanus gouldii	Sand Monitor or Goulds Sand Goanna		X
Cryptoblepharus plagiocephalus	Callose-palmed Shinning Skink or Peron's Snake-eyed Skink		X
Ctenotus robustus	Robust Striped Skink		X
Ctenotus orientalis	Eastern Spotted Ctenotus		
Hemiergis decresiensis	Three-toed Earless Skink		X
Hemiergis peronii	Four-toed Earless Skink or Lowlands Earless Skink		X
Lampropholis guichenoti	Garden Skink		
Lerista bougainvillii	Bouganvilles Skink		X
Lerista dorsalis	Southern Slider		X
Lerista frosti	Centralian Slider		X
Lerista terdigitata	Southern Three-toed Slider		
Menetia greyii	Common Dwarf Skink		X
Morethia adelaidenis	Saltbush Morethia Skink		X
Morethia obscura	Scrubland Morethia Skink		X
Pseudemoia entrecasteauxii	Southern Grass Skink, Tussock Cool-skink, Entrecasteaux's Skink	V	X
Tiliqua occipitulis	Western Blue Tongue Lizard		X
Tiliqua rugosa	Shingle-back Lizard, Sleepy Lizard, Pinecone Lizard or Stumpy Tail Lizard		X
Tiliqua scincoides	Eastern Bluetongue		
Ramphotyphlops australis	Southern Blind Snake		
Ramphotyphlops bituberculata	Prong-snouted Blind Snake		X
Demansia psammophis	Yellow-faced Whip Snake		X
Notechis scutatus	Eastern Tiger Snake	V	
Pseudechis porphyriacus	Red-bellied Black Snake		
Pseudonaja textilis	Eastern Brown Snake		X

Appendix 11: Native mammal species that are present in south Torrens Island and may occur in the study area

Table 1. Bat species for which calls were recorded using Anabat™ SD1 echolocation devices (Titley Electronics, Ballina, New South Wales, Australia) in between 18 to 22 and 26 to 30 October 2009 where bat detectors were programmed to record from sunset for a continuous period of 4 hours.

	Chalinolobus gouldii	*Chalinolobus morio*	*Mormopterus spp.*	*Tadarida australis*	*Nyctophyllus spp.*	*Scotorepens spp.*	*Saccolaimus flaviventris*	*Vespadelus baverstocki*	*Vespadelus rugulus*	*V. vulturnus*	*Vespadelus spp.*	*Unidentified*	*Total no. calls*
Total no. calls per species	204	3	514	160	0	0	0	0	0	0	2	625	1508
1 Mangrove canopy													
26-Oct-2009	1			4								8	13
27-Oct-2009	4		5	1								7	17
28-Oct-2009			2									14	16
29-Oct-2009	1		2	1								1	5
Subtotal no. calls	6	0	9	6	0	0	0	0	0	0	0	30	51
2 Mangrove canopy													
26-Oct-2009	22		5	7								57	91
27-Oct-2009	32		14	3								100	149
28-Oct-2009	4			1								4	9
29-Oct-2009				1								1	2
Subtotal no. calls	58	0	19	12	0	0	0	0	0	0	0	162	251
3 Salt marsh canopy													
18-Oct-2009	6		6									8	20
19-Oct-2009	1			2								3	6
20-Oct-2009	4		1	9								2	16
21-Oct-2009			1	11								3	15
Subtotal no. calls	11	0	8	22	0	0	0	0	0	0	0	16	57
4 Light post													
18-Oct-2009	26		55									50	131
19-Oct-2009	1		6									1	8
20-Oct-2009	9		11	2								5	27
21-Oct-2009	4		22	7								11	44
26-Oct-2009	2		2	3								13	20
27-Oct-2009	2		20	1								2	25
28-Oct-2009	3		1	2								1	7
29-Oct-2009				1								6	7

continued

	Chalinolobus gouldii	*Chalinolobus morio*	*Mormopterus spp.*	*Tadarida australis*	*Nyctophyllus spp.*	*Scotorepens spp.*	*Saccolaimus flaviventris*	*Vespadelus baverstocki*	*Vespadelus rugulus*	*V. vulturnus*	*Vespadelus spp.*	*Unidentified*	*Total no. calls*
30-Oct-2009													0
Subtotal no. calls	47	0	117	16	0	0	0	0	0	0	0	89	269
5 Freshwater soak													
18-Oct-2009	6		8	1								11	26
19-Oct-2009			2									4	6
20-Oct-2009	2		2	9								4	17
21-Oct-2009	2		2	3								13	20
26-Oct-2009	1			2								6	9
27-Oct-2009	5		46									20	71
28-Oct-2009	3		1	6								5	15
29-Oct-2009			1	1								1	3
Subtotal no. calls	19	0	62	22	0	0	0	0	0	0	0	64	167
6 Sand dune community													
18-Oct-2009	7		4									10	21
19-Oct-2009	2			2								1	5
20-Oct-2009	4		1	9								3	17
21-Oct-2009			1	11								3	15
26-Oct-2009	3		1	3								1	8
27-Oct-2009	32		73	2								44	151
28-Oct-2009	4		7	10								4	25
29-Oct-2009		0	137	25									162
Subtotal no. calls	52	0	224	62	0	0	0	0	0	0	0	66	404
7 Sand dune community													
18-Oct-2009	7	1	72								2	159	241
19-Oct-2009	1	1		3								10	15
20-Oct-2009		1	3	15								10	29
21-Oct-2009	3			2								19	24
Subtotal no. calls	11	3	75	20	0	0	0	0	0	0	2	198	309

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Table 2. Mammal species that have been identified in south Torrens Island (TI) and may occur in the study area. State (S) classifications are provided (see Table 1, Appendix 2 for definitions of classifications used to assess conservation significance of fauna).

Species name	Common name	S	South TI	May be present
Saccolaimus flaviventris	Yellow-tailed Sheathtail Bat	R		X
Tadarida australis	White-striped Freetail-bat		X	X
Mormopterus planiceps	Southern Freetail-bat		X	X
Nyctophilus geoffroyi	Lesser Long-eared Bat			X
Chalinolobus gouldii	Gould's Wattled Bat		X	X
Chalinolobus morio	Chocolate Wattled Bat			X
Scotorepens balstoni	Inland Broad-nosed Bat			X
Vespadelus darlingtoni	Large Forest Bat			X
Vespadelus regulus	Southern Forest Bat			X
Vespadelus vulturnus	Little Forest Bat			X
Hydromys chrysogaster	Water Rat			X
Rattus fuscipes	Bush rat			X

Table 3. Exotic mammal species that occur in the study area. National (N) and state (S) classifications are provided (see Table 1, Appendix 3 for definitions of classifications used to assess exotic fauna).

Species name	Common name	N	S
Mus musculus	House Mouse		
Vulpes vulpes	Fox	X	X
Felis catus	Cat	X	X
Rattus rattus	Black rat		
Oryctolagus cuniculus	Rabbit	X	X

APPENDIX 11

Appendix 12: Bird species that may occur in the study area

Table 1. Bird species that may occur in the study area. National (N), state (S) and regional (R) classifications are provided and species listed under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA) or the *Environment Protection and Biodiversity Conservation Act 1999* as migratory species are indicated (see Table 1, Appendix 2 for definitions of classifications used to assess conservation significance of fauna).

Order and guild	Species name	Common name	JAMBA	CAMBA	EPBC Migratory	N	S	R
Quails								
Phasianidae	*Coturnix ypsilophora*	Brown Quail					V	V
Ducks, Geese and Swans								
Anseriformes	*Biziura lobata*	Musk Duck					R	
Anseriformes	*Cygnus atratus*	Black Swan						
Anseriformes	*Tadorna tadornoides*	Australian Shelduck						
Anseriformes	*Chenonetta jubata*	Australian Wood Duck						
Anseriformes	*Anas rhynchotis*	Australian Shoveler					R	
Anseriformes	*Anas gracilis*	Grey Teal						
Anseriformes	*Anas castanea*	Chestnut Teal						
Anseriformes	*Anas platyrhynchos*	Northern Mallard						
Anseriformes	*Anas superciliosa*	Pacific Black Duck						
Anseriformes	*Aythya australis*	Hardhead						
Anseriformes	*Oxyura australis*	Blue-billed Duck					R	
Grebes								
Podicipediformes	*Poliocephalus poliocephalus*	Hoary-headed Grebe						
Doves and Pigeons								
Columbiformes	*Columba livia*	Rock Dove						
Columbiformes	*Streptopelia chinensis*	Spotted Dove						
Columbiformes	*Phaps chalcoptera*	Common Bronzewing						
Columbiformes	*Phaps elegans*	Brush Bronzewing						U
Columbiformes	*Ocyphaps lophotes*	Crested Pigeon						
Petrels								
Procellariiformes	*Daption capense*	Cape Petrel						
Pelicans, Darters and Cormorants								
Pelecaniformes	*Anhinga novaehollandiae*	Australasian Darter						
Pelecaniformes	*Phalacrocorax carbo*	Great Cormorant						
Pelecaniformes	*Phalacrocorax sulcirostris*	Little Black Cormorant						
Pelecaniformes	*Phalacrocorax varius*	Pied Cormorant						
Pelecaniformes	*Phalacrocorax fuscescens*	Black-faced Cormorant						
Pelecaniformes	*Pelecanus conspicillatus*	Australian Pelican						

continued

Order and guild	Species name	Common name	JAMBA	CAMBA	EPBC Migratory	N	S	R
Herons, Ibises, Spoonbills and Storks								
Ciconiiformes	*Ardea pacifica*	White-necked Heron						
Ciconiiformes	*Ardea ibis*	Cattle Egret*	J	C	X			
Ciconiiformes	*Ardea modesta*	Eastern Great Egret*	J	C	X			
Ciconiiformes	*Egretta garzetta*	Little Egret					R	
Ciconiiformes	*Egretta sacra*	Eastern Reef Egret*		C			R	
Ciconiiformes	*Egretta novaehollandiae*	White-faced Heron						
Ciconiiformes	*Nycticorax caledonicus*	Nankeen Night-Heron						
Ciconiiformes	*Plegadis falcinellus*	Glossy Ibis*		C			R	
Ciconiiformes	*Threskiornis molucca*	Australian White Ibis						
Ciconiiformes	*Platalea regia*	Royal Spoonbill						
Ciconiiformes	*Platalea flavipes*	Yellow-billed Spoonbill						
Birds of Prey								
Accipitriformes	*Elanus axillaris*	Black-shouldered Kite						
Falcons								
Falconiformes	*Haliaeetus leucogaster*	White-bellied Sea-Eagle*		C	X		V	
Falconiformes	*Haliastur sphenurus*	Whistling Kite						U
Falconiformes	*Accipiter fasciatis*	Brown Goshawk						
Falconiformes	*Accipiter cirrocephalus*	Collared Sparrowhawk						
Falconiformes	*Circus approximans*	Swamp Harrier						
Falconiformes	*Hieraaetus morphnoides*	Little Eagle						
Falconiformes	*Falco cenchroides*	Nankeen Kestrel						
Falconiformes	*Falco berigora*	Brown Falcon						
Falconiformes	*Falco longipennis*	Australian Hobby						
Falconiformes	*Falco subniger*	Black Falcon						
Falconiformes	*Falco peregrinus*	Peregrine Falcon					R	R
Cranes, Rails, Moorhens and Coots								
Gruiformes	*Porphyrio porphyrio*	Purple Swamphen						
Gruiformes	*Porzana pusilla*	Baillon's Crake					R	R
Gruiformes	*Porzana tabuensis*	Spotless Crake					R	U
Gruiformes	*Gallinula tenebrosa*	Dusky Moorhen						
Gruiformes	*Tribonyx ventralis*	Black-tailed Native-hen						
Gruiformes	*Fulica atra*	Eurasian Coot						
Waders								
Charadriiformes	*Haematopus longirostris*	Australian Pied Oystercatcher					R	
Charadriiformes	*Haematopus fuliginosus*	Sooty Oystercatcher					R	
Charadriiformes	*Recurvirostra novaehollandiae*	Red-necked Avocet						

continued

Order and guild	Species name	Common name	JAMBA	CAMBA	EPBC Migratory	N	S	R
Charadriiformes	*Himantopus himantopus*	Black-winged Stilt						
Charadriiformes	*Cladorhynchus leucocephalus*	Banded Stilt					V	
Charadriiformes	*Pluvialis fulva*	Pacific Golden Plover					R	
Charadriiformes	*Charadrius dubius*	Little Ringed Plover						
Charadriiformes	*Charadrius ruficapillus*	Red-capped Plover						
Charadriiformes	*Charadrius mongolus*	Lesser Sand Plover*	J	C			R	
Charadriiformes	*Thinornis rubricollis*	Hooded Plover						
Charadriiformes	*Elseyornis melanops*	Black-fronted Dotterel						
Charadriiformes	*Erythrogonys cinctus*	Red-kneed Dotterel						
Charadriiformes	*Vanellus tricolor*	Banded Lapwing						
Charadriiformes	*Vanellus miles*	Masked Lapwing						
Charadriiformes	*Rostratula australis*	Australian Painted Snipe*		C	X	V	R	
Charadriiformes	*Gallinago hardwickii*	Latham's Snipe *	J	C	X			
Charadriiformes	*Gallinago stenura*	Pin-tailed Snipe						
Charadriiformes	*Limosa limosa*	Black-tailed Godwit*	J	C				
Charadriiformes	*Limosa lapponica*	Bar-tailed Godwit*	J	C			R	
Charadriiformes	*Numenius minutus*	Little Curlew						
Charadriiformes	*Numenius phaeopus*	Whimbrel*	J	C			R	
Charadriiformes	*Numenius madagascariensis*	Eastern Curlew*	J	C			V	
Charadriiformes	*Xenus cinereus*	Terek Sandpiper*		C			R	
Charadriiformes	*Actitis hypoleucos*	Common Sandpiper					R	
Charadriiformes	*Tringa nebularia*	Common Greenshank *	J	C				
Charadriiformes	*Tringa stagnatilis*	Marsh Sandpiper*	J	C				
Charadriiformes	*Tringa totanus*	Common Redshank						
Charadriiformes	*Tringa glareola*	Wood Sandpiper*	J	C			R	
Charadriiformes	*Limnodromus semipalmatus*	Asian Dowitcher						
Charadriiformes	*Calidris tenuirostris*	Great Knot*	J	C			R	
Charadriiformes	*Calidris camutus*	Red Knot*	J	C				
Charadriiformes	*Calidris ruficollis*	Red-necked Stint*	J	C				
Charadriiformes	*Calidris acuminata*	Sharp-tailed Sandpiper*	J	C				
Charadriiformes	*Calidris ferruginea*	Curlew Sandpiper*	J	C				
Charadriiformes	*Limicola falcinellus*	Broad-billed Sandpiper						
Charadriiformes	*Philomachus pugnax*	Ruff (Reeve)*	J	C			R	
Charadriiformes	*Sterna albifrons*	Little Tern*	J	C	X		V	
Charadriiformes	*Sternula nereis*	Fairy Tern					E	
Charadriiformes	*Hydropogne tschegrava*	Caspian Tern*	J	C				
Charadriiformes	*Chlidonias hybrida*	Whiskered Tern						
Charadriiformes	*Sterna hirundo*	Common Tern*	J	C			R	

continued

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Order and guild	Species name	Common name	JAMBA	CAMBA	EPBC Migratory	N	S	R
Charadriiformes	*Thalasseus bergii*	Crested Tern*	J					
Charadriiformes	*Larus pacificus*	Pacific Gull						
Charadriiformes	*Chroicocephalus novaehollandiae*	Silver Gull						
Parrots								
Psittaciformes	*Eolophus roseicapillus*	Galah						
Psittaciformes	*Cacatua galerita*	Sulphur-crested Cockatoo						
Psittaciformes	*Nymphicus hollandicus*	Cockatiel						
Psittaciformes	*Trichoglossus haematodus*	Rainbow Lorikeet						
Psittaciformes	*Glossopsitta concinna*	Musk Lorikeet						
Psittaciformes	*Glossopsitta porphyrocephala*	Purple-crowned Lorikeet						
Psittaciformes	*Platycercus elegans*	Crimson Rosella						
Psittaciformes	*Melopsittacus undulatus*	Budgerigar						
Psittaciformes	*Neophema elegans*	Elegant Parrot					R	
Psittaciformes	*Neophema petrophila*	Rock Parrot					RA	
Cuckoos								
Cuculiformes	*Chalcites basalis*	Horsfield's Bronze-Cuckoo						V
Terrestrials								
Coraciiformes	*Chalcites lucidus*	Shining Bronze-Cuckoo					R	R
Coraciiformes	*Todiramphus sanctus*	Sacred Kingfisher						U
Coraciiformes	*Merops ornatus*	Rainbow Bee-eater			X			
Passerines								
Passeriformes	*Cormobates leucophaea*	White-throated Treecreeper						
Passeriformes	*Lalage leucopyga*	White-winged Triller						
Passeriformes	*Malurus cyaneus*	Superb Fairy-wren						
Passeriformes	*Malurus leucopterus*	White-winged Fairy-wren						
Passeriformes	*Sericornis frontalis*	White-browed Scrubwren						
Passeriformes	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill						U
Passeriformes	*Acanthiza apicalis*	Inland Thornbill						
Passeriformes	*Acanthiza pusilla*	Brown Thornbill						
Passeriformes	*Pardalotus striatus*	Striated Pardalote						
Passeriformes	*Lichenostomus chrysops*	Yellow-faced Honeyeater						
Passeriformes	*Lichenostomus virescens*	Singing Honeyeater						
Passeriformes	*Lichenostomus penicillatus*	White-plumed Honeyeater						

continued

APPENDIX 12

Order and guild	Species name	Common name	JAMBA	CAMBA	EPBC Migratory	N	S	R
Passeriformes	*Anthochaera chrysoptera*	Little Wattlebird						U
Passeriformes	*Anthochaera carunculata*	Red Wattlebird						
Passeriformes	*Epthianura albifrons*	White-fronted Chat						U
Passeriformes	*Phylidonyris pyrrhopterus*	Crescent Honeyeater						
Passeriformes	*Phylidonyris novaehollandiae*	New Holland Honeyeater						
Passeriformes	*Pachycephala pectoralis*	Golden Whistler						
Passeriformes	*Pachycephala rufiventris*	Rufous Whistler						U
Passeriformes	*Colluricincla harmonica*	Grey Shrike-thrush						
Passeriformes	*Artamus cyanopterus*	Dusky Woodswallow						
Passeriformes	*Crasticus torquatus*	Grey Butcherbird						
Passeriformes	*Cracticus tibicen*	Australian Magpie						
Passeriformes	*Rhipidura albiscapa*	Grey Fantail						
Passeriformes	*Rhipidura leucophrys*	Willie Wagtail						
Passeriformes	*Corvus coronoides*	Australian Raven						
Passeriformes	*Corvus mellori*	Little Raven						
Passeriformes	*Petroica boodang*	Scarlet Robin					R	V
Passeriformes	*Alauda arvensis*	Eurasian Skylark						
Passeriformes	*Cisticola exilis*	Golden-headed Cisticola					R	
Passeriformes	*Acrocephalus australis*	Australian Reed-Warbler						
Passeriformes	*Megalurus gramineus*	Little Grassbird						
Passeriformes	*Cincloramphus mathewsi*	Rufous Songlark						
Passeriformes	*Cinclorhamphus cruralis*	Brown Songlark						
Passeriformes	*Zosterops lateralis*	Silvereye						
Passeriformes	*Hirundo neoxena*	Welcome Swallow						
Passeriformes	*Petrochelidon nigricans*	Tree Martin						U
Passeriformes	*Turdus merula*	Common Blackbird						
Passeriformes	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike						
Passeriformes	*Sturnus vulgaris*	Common Starling						
Passeriformes	*Anthus novaeseelandiae*	Australian Pipit						
Passeriformes	*Carduelis carduelis*	European Goldfinch						
Passeriformes	*Chloris chloris*	Common Greenfinch						

APPENDIX 12

Appendix 13: *Environment Protection and Biodiversity Act 1999* database on matters of national environmental significance report for birds

Table 1. Threatened bird species, migratory bird species and listed marine species identified in the *Environment Protection and Biodiversity Act 1999* (EPBC Act 1999) database on matters of national environmental significance report in the area of Torrens Island, Garden Island, Port River, Angas Inlet, North Arm and Barker Inlet [1] (see Appendix 2 for definitions of classifications used to assess conservation significance of fauna).

Species name	Common name	Status
Diomedia exulans gibsoni	Gibson's Albatross	Vulnerable
Thalassarche melanophris impavida	Black-browed Albatross	Vulnerable
Thalassarche cauta cauta	Shy Albatross	Vulnerable
Thalassarche bulleri	Buller's Albatross	Vulnerable
Macronectes Giganteus	Southern Giant-petrel	Endangered
Macronectes halli	Northern Giant-petrel	Vulnerable
Rostratula australis	Australian Painted Snipe	Vulnerable
Neophema chrysogaster	Orange-bellied Parrot	Critically Endangered
Migratory Species		
Hirundapus caudacutus	White-throated Needletail	
Apus pacificus	Fork-tailed Swift	
Diomedia exulans gibsoni	Gibson's Albatross	
Thalassarche melanophris impavida	Black-browed Albatross	
Thalassarche cauta cauta	Shy Albatross	
Thalassarche bulleri	Buller's Albatross	
Macronectes giganteus	Southern Giant-petrel	
Macronectes halli	Northern Giant-petrel	
Ardea ibis	Cattle Egret	
Ardea modesta	Eastern Great Egret	
Haliaeetus leucogaster	White-bellied Sea-Eagle	
Rostratula australis	Australian Painted Snipe	
Gallinago hardwickii	Latham's Snipe, Japanese Snipe	
Sterna albifrons	Little Tern	
Merops ornatus	Rainbow Bee-eater	
Neophema chrysogaster	Orange-bellied Parrot	
Other Matters Protected by the EPBC Act		
Listed Marine Species		
Biziura lobata	Musk Duck	
Hirundapus caudacutus	White-throated Needletail	
Apus pacificus	Fork-tailed Swift	
Diomedia exulans gibsoni	Gibson's Albatross	
Thalassarche melanophris impavida	Black-browed Albatross	
Thalassarche cauta cauta	Shy Albatross	
Thalassarche bulleri	Buller's Albatross	
Macronectes giganteus	Southern Giant-petrel	
Macronectes halli	Northern Giant-petrel	
Phalacrocorax fuscescens	Black-faced Cormorant	

continued

Species name	Common name	Status
Pelecanus conspicillatus	Australian Pelican	
Ardea ibis	Cattle Egret	
Ardea modesta	Eastern Great Egret	
Egretta garzetta	Little Egret	
Egretta sacra	Eastern Reef Egret	
Nycticorax caledonicus	Nankeen Night-Heron	
Threskiornis molucca	Australian White Ibis	
Haliaeetus leucogaster	White-bellied Sea-Eagle	
Haliastur sphenurus	Whistling Kite	
Circus approximans	Swamp Harrier	
Falco cenchroides	Nankeen Kestrel	
Porphyrio porphyrio	Purple Swamphen	
Porzana pusilla	Baillon's Crake	
Recurvirostra novaehollandiae	Red-necked Avocet	
Himantopus himantopus	Black-winged Stilt	
Charadrius ruficapillus	Red-capped Plover	
Charadrius mongolus	Lesser Sand Plover	
Rostratula australis	Australian Painted Snipe	
Gallinago hardwickii	Latham's Snipe, Japanese Snipe	
Numenius phaeopus	Whimbrel	
Numenius madagascariensis	Eastern Curlew	
Tringa nebularia	Common Greenshank, Greenshank	
Tringa stagnatilis	Marsh Sandpiper	
Limnodromus semipalmatus	Asian Dowitcher	
Calidris tenuirostris	Great Knot	
Calidris ruficollis	Red-necked Stint	
Calidris acuminata	Sharp-tailed Sandpiper	
Calidris ferruginea	Curlew Sandpiper	
Stiltia isabella	Australian Pratincole	
Sterna albifrons	Little Tern	
Hydropogne tschegrava	Caspian Tern	
Chlidonias hybrida	Whiskered Tern	
Thalasseus bergii	Crested Tern	
Larus pacificus	Pacific Gull	
Chroicocephalus novaehollandiae	Silver Gull	
Neophema petrophila	Rock Parrot	
Chalcites basalis	Horsfield's Bronze-Cuckoo	
Chalcites lucidus	Shining Bronze-Cuckoo	
Todiramphus sanctus	Sacred Kingfisher	
Merops ornatus	Rainbow Bee-eater	
Corvus mellori	Little Raven	
Acrocephalus australis	Australian Reed-Warbler	
Zosterops lateralis	Silvereye	
Hirundo neoxena	Welcome Swallow	
Petrochelidon nigricans	Tree Martin	
Coracina novaehollandiae	Black-faced Cuckoo-shrike	
Neophema chrysogaster	Orange-bellied Parrot	

Threatened bird species identified in the EPBC Act 1999 not likely to occur in the study area

The following six species are pelagic species that are not likely to occur in the study area and as vagrants are not associated with one place. The Orange-bellied Parrot is unlikely to occur in the study area. The following descriptions were provided by CNS [2].

Gibson's Albatross

The breeding range of the Gibson's Albatross is restricted to areas of New Zealand, however it does spend non-breeding foraging periods foraging widely within the Tasman Sea and South Pacific Ocean. Individuals have been recorded offshore in south-east Australian waters from Coff's Harbour in the north to Wilson's Promontory in the south [3].

The current population of Gibson's Albatross is estimated at 10,000 breeding pairs and 40,000 individuals globally. The key threats to the Gibson's Albatross are interactions with commercial fishing operations, predation by feral animals and habitat degradation.

There are no records of the Gibson's Albatross being present in the study area. Gibson's Albatross is considered a pelagic species and

Black-browed Albatross

The Black-browed Alabtross is endemic to New Zealand and occurs across Antarctic and sub-Antarctic waters and in the subtropical South Pacific Ocean [4]. They breed only on sub-Antarctic Campbell Island, south of New Zealand, nesting on ledges and steep slopes covered in low native grasses, tussocks and mud [4]. Non-breeding birds often forage over the continental slopes around Tasmania, Victoria and New South Wales. The current estimate of breeding pairs is 26, 4000, and thought to be decreasing. The key threat to the Campbell albatross is commercial fisheries. There are no records of the Black-browed Albatross in the study area.

Shy Albatross

The Shy Albatross is the only albatross species endemic to Australia. The Shy Albatross occur over all Australian coastal waters below 25° S. It is most commonly observed over the shelf waters around Tasmania and south-eastern Australia and in some instances ranging well inshore over the continental shelf, even entering bays and harbours [3]. Breeding locations are Albatross Island, Mewstone and Pedra Branca, Tasmania. The total breeding population of the Shy Albatross is 12, 200 breeding pairs and 55, 000 to 60, 000 individuals are suspected to exist. The current population is only estimated to be 25% of historical numbers; however the population on Albatross Island is increasing [3].

There are no records of the Shy Albatross in the study area.

Buller's Albatross

Buller's Albatross is endemic to New Zealand with high concentrations of birds found in southern New Zealand during the breeding season. Outside of breeding season individuals have been observed in Australian waters south of Coff's Harbour, around Tasmania, and west to the Eyre Peninsula. Bullers albatross is not known to breed within Australia. The total global

breeding population is estimated to be 11, 500 pairs, and a total of between 50, 000 and 55, 000 individuals [3]. The population is expected to be currently stable. Current threats to the Buller's Albatross include habitat degradation, commercial fisheries, and predation by feral predators. There are no records of the Buller's Albatross in the study area.

Southern Giant-petrel

During non-breeding season the Southern Giant-petrel can migrate and disperse great distances over the Southern Ocean. The Southern Giant-petrel is known to breed in Australia on Macquarie Island, Heard Island, McDonald Island and in Australian Antarctic Territory [3]. These islands are considered to be critical habitat for these species. There are no foraging, but not breeding habitats, within Australia.

The current global population of Southern Giant-petrel was recently estimated to be 31,358 breeding pairs. Threats to the ongoing survival of the Southern Giant-petrel are incidental catch and hook ingestion during commercial fishing operations, predation by feral animals and habitat degradation.

There have been no direct sightings of the Southern Giant-petrel in the project area, however there has been evidence of the occasional visit, the most recent being 1983. Given that there are only three records of such visits to the project area the presence of the Southern Giant-petrel to the project area is likely to be limited to the occasional transient visitor.

Northern Giant-petrel

The Northern Giant-petrel has a circumpolar pelagic distribution. Breeding in Australian territory is limited to Macquarie Island and occurs during spring and summer. The current population of the northern giant petrel is estimated to be between 17, 000 and 21, 000 and increasing [5]. Current threats to the northern giant petrel include illegal or unregulated Southern Ocean longline fisheries, introduced predators and habitat loss or degradation. There are no records of the Northern Giant-petrel in the study area.

Orange-bellied Parrot

The Orange-bellied Parrot is listed as critically endangered under the EPBC Act 1999 and is endemic to south-eastern Australia including Tasmania. Historically, the species' range on the mainland extended from Adelaide, southeast through the Coorong, Robe, Beachport and Port MacDonnell in South Australia, east through south western coastal Victoria, Port Phillip Bay to South Gippsland, and north to near Sydney. In Tasmania the species extended along the west and south coasts, east to Bruny Island. However it is now rarely recorded in large numbers through the historical inland distribution [6].

The current Orange-bellied Parrot population is restricted to a single population, breeding in south west Tasmania and migrating along the west coast of Tasmania, crossing western Bass Strait to coastal Victoria. The key threats to the Orange-bellied Parrot:

- loss of habitat and reduction in habitat quality;
- introduction and spread of invasive weeds;

- introduced predators and competitors;
- wind energy developments;
- disease; and
- commercial fishing.

Orange-bellied Parrots have not been recorded within the project area and surrounds, further the project area is classified as infrequent non-breeding range and is not considered critical.

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5. *Norther giant petrel*. 2009, BirdLife International. Available at http://www.birdlife.org/datazone/species/index.html?action=SpcHTMDetails.asp&sid=3871&m=0#.
6. *Orange-bellied Parrot recovery plan*. 2006, Department of Primary Industries and Water, Hobart, Tasmania.

Appendix 14: Wader roosting habitat

Source: Satellite imagery - Google Earth, 2009.

Figure 1. Locations of photographs for wader roosting habitat assessment, conducted 18 October 2009

APPENDIX 14

Figure 2. Photograph location 1

Figure 3a. Photograph location 2

Figure 3b. Photograph location 2

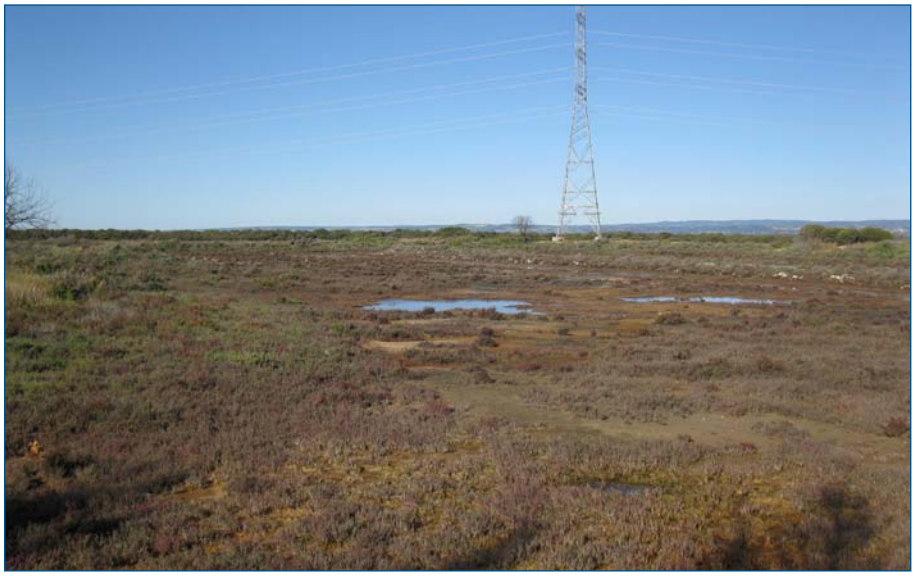

Figure 4a. Photograph location 3

Figure 4b. Photograph location 3

Figure 5. Photograph location 4

Figure 6. Photograph location 5

Figure 7. Photograph location 6

Figure 8. Photograph location 7

Figure 9a. Photograph location 8

Figure 9b. Photograph location 8