Cultana Expansion Area Environment and Heritage Studies

DEPARTMENT OF DEFENCE

Environmental Baseline Condition Report

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Executive Summary

The Australian Defence Force (Defence) was granted a Miscellaneous Lease for Defence Purposes (MLDP) over the Cultana Expansion Area (CEA) on 4 June 2012 by the South Australian Government. Adoption of the CEA has resulted in the expansion of the existing Cultana Range Training Area (CUTA) now covering 209,300 hectares located on the Eyre Peninsula, South Australia. The increase in size of the CUTA will provide a suitable location to conduct future air to ground and ground to air training activities. Defence engaged Jacobs to prepare an Environmental Baseline Condition Report (EBCR) to meet the approval conditions of the proposed CEA.

The Defence CEA proposal was approved by the Federal Minister for Environment, subject to a series of conditions. This EBCR document fulfils the terms of Condition 11 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval, describing the baseline condition of the environment at the CEA. This was achieved by undertaking:

- A desktop review of regional literature and data, including previous work undertaken at the existing CUTA, for the CEA Public Environment Report (PER), and other existing management plans contributing to the Environmental Management Framework
- A comprehensive baseline flora and fauna survey, including targeted searches for EPBC listed species, listed vegetation communities and threatening processes
- Ground-truthing of relevant environmental features and conditions that have been raised through previous desktop assessment

The CEA has been used as pastoral land for more than 100 years, the processes of which have shaped the physical and biological qualities observed in the region today.

Environmentally Sensitive Features

For the purposes of this study, and in accordance with Condition 11 c) of the *EPBC Act* Approval for the CEA, environmentally sensitive features have been identified as including clay pans, contaminated sites, and highly erodible or saline soils. Comprehensive ground-truthed mapping across the CEA was undertaken to identify areas where these features may be present.

Potentially contaminating activities (PCAs) observed across the CEA were largely localised to homesteads and surrounding outbuildings and infrastructure, and the former Whyalla Gliding Club. The key area of concern with respect to site contamination that may have occurred as a result of historical PCAs on the CEA is related to bulk fuel storage and waste oil disposal. There were three underground fuel storage tanks (USTs) identified across the CEA; a single UST present at each of the three homesteads (Roopena, Middleback, and Tregalana). The USTs were located adjacent to oil / fuel storage sheds, with remnants of a former fuel bowser identified at Tregalana Homestead. The integrity of the USTs is not known. Furthermore, it is not known if there have been historical product losses from the USTs. A waste oil soakge pit was also identified at the Middleback Homestead.

There is potential for asbestos containing materials (ACM) and ACM related land contamination around buildings (from asbestos fibre and / or ACM fragments generated from such things as vandalism, maintenance activities and / or general degradation) and supporting infrastructure to be present in isolated areas of the CEA. It was beyond the scope of this study to determine ACM contamination. Further assessment / remediation of potential site contamination may occur as part of rectification works to be conducted prior to Defence use of the CEA.

A total of 11 clay pan areas were identified across the CEA. There was minor existing erosion identified across the CEA, most commonly associated with tracks that traverse ephemeral creeklines or low lying areas (e.g. flood plains), and on or adjacent man-made earthen features (e.g. dam walls). Highly erodible soils are present in a number of isolated patches, typically where there is a concentration of ephemeral creek lines and sparser vegetation cover.

One ephemeral salt lake has been identified in the north-eastern corner of the CEA, and a second (minor) area of potential saline soil to the southeast of the salt lake. No other evidence of saline soils was found on site. No natural permanent water bodies are present within the CEA.

Culturally Significant Features

Indigenous (Cultural) and Historical heritage has been assessed as part of the overarching heritage surveys conducted across the CEA. The surveys resulted in 55 archaeological sites and 92 anthropological sites being recorded between 2007 and 2014. These sites have subsequently been spatially grouped into 64 Restricted Areas (RAs) within the CEA to reflect the Indigenous site management approach of the existing CUTA Indigenous Heritage Management Plan (IHMP). Historical heritage values represented in the CEA predominantly reflect pastoral activity and are linked to three pastoral complexes (Middleback, Tregalana and Roopena). The Historical heritage value of the former Whyalla Gliding Club was also considered (and is subject to further background assessment), however this ares is likely to be only of local significance

Indigenous heritage values within the CEA is to be managed through the recommendations of the CEA IHMP, acknowledgement of RA locations within Range Standing Orders (RSOs) and processes to inform users prior to training activities. This will include ongoing consultation with the Indigenous Stakeholders via the prescribed cultural heritage requirements outlined in the Indigenous Land Use Agreement agreement. Historical heritage values within the CEA will be managed through completion of a comprehensive archival photographic recording report in accordance with the Defence Heritage Toolkit (currently being undertaken by Jacobs).

Environmental Habitat Condition

The current land condition of the CEA has been shaped by long term low to moderate agricultural sheep grazing activity, similar to that observed across the region. Shortly after acquisition of the CEA, grazing ceased on the site and the vegetation is now in a state of transition. Whilst areas in the immediate vicinity of some livestock watering points have been highly disturbed and in poor condition, overall habitat condition was considered to be moderate to good throughout the CEA as evidenced by relatively stable soil surfaces, palatable flora species recruitment, richness of native species, low total grazing pressure and low levels of declared weed infestations.

Vegetation Communities and Floral Species

Overall, 396 flora species (347 native and 49 exotic) have been confirmed to occur within the CEA.

Habitat classification results from both AECOM (2012a) and this field survey have been standardised and simplified by matching floristic communities described by AECOM (2012a) to recognised Eyre Peninsula vegetation communities. This approach has provided benchmarked indicators of diversity and condition against which to assess the described habitats. The majority of the CEA habitat (97 %) is considered to be open mallee and low open woodlands with a chenopod shrub understorey and chenopod open shrublands. Two vegetation communities of high biodiversity value were identified on site: Old Growth Mallee, and Lignum Shrubland Swamps. These communities provide important habitat for wildlife.

Weeds are common throughout the CEA. A total of 49 weeds have been recorded, including two Weeds of National Significance including; African Boxthorn (*Lycium ferocissimum*) and Prickly Pear (*Austrocylindropuntia* spp., *Cylindropuntia* spp., *Opuntia* spp) and four Declared (South Australian Natural Resources Management Act 1972) species including; Three Corner Jack (*Emex* sp.), Salvation Jane (*Echium plantagineum*) and Horehound (*Marrubium vulgare).*

Diversity and Abundance of Fauna Species

The flora and fauna survey of the CEA used a range of standard biological survey methodologies (Heard and Channon, 1997; Owens 2000). Six sites were selected to represent a range of habitat types to maximise possible return for effort. In addition, opportunistic fauna sightings were made across a variety of habitats throughout the survey. Overall, a total of 144 fauna species (103 birds, 22 reptiles and 19 mammals) have been confirmed within the CEA. Fauna species diversity was considered to be generally consistent with the condition of the habitat encountered during the survey. Low levels of vertebrate pests were observed on site.

Parrots were poorly represented across the site while most other groups of Eyre Peninsula birds were represented. Bat species richness was good and consistent with what would usually be expected for chenopod and mallee habitat with few hollows present, with the notable presence of three common groups (*Nyctophilus, Mormopterus* and *Vespadelus*). Reptile species richness was considered to be below to what would normally be expected for this previously pastoral dominated habitat type on the Eyre Peninsula.

Protected Species and Other Matters

No flora species of national conservation significance (EPBC Act) have been observed within the CEA. Three species of state conservation significance have been observed (NPW Act); Sandalwood (*Santalum spicatum*, Vulnerable), Flinders Ranges Wattle (*Acacia iteaphylla*, Rare), and Spreading Cress (*Phlegmatospermum eremaeum*, Rare).

One fauna species listed under the EPBC Act was recorded at multiple sites within the CEA: Western Grasswren (*Amytornis textilis myall*). This species is resident across most of this region and is known to utilise the widespread chenopod and saltbush shrublands across the site. Five other species protected under the state NPW Act were recorded across the study area: Slender-billed Thornbill (*Acanthiza iredalei iredalei*, SA Rare), Gilbert's Whistler (*Pachycephala inornata*, SA Rare), Major Mitchell's Cockatoo (*Cacatua leadbeateri*, SA Rare), White-browed Treecreeper (*Climacteris affinis*, SA Rare) and an Australasian Shoveler (*Anas rhynchotis*, SA Rare). Potential future DoD activities are not expected to significantly impact any of these species due to the mobility of the individuals of these species and quantity of suitable habitat for individuals to move to in the wider Eyre Peninsula.

One EPBC listed flora and three EPBC listed fauna were considered likely to occur within the CEA. In addition, Three EPBC listed flora and 35 EPBC listed fauna were considered unlikely to occur within the CEA. Likelihood justifications are provided in the report below, based on current distributions, historical records, ecological knowledge and results of other regional surveys.

No vegetation communities of conservation significance were recorded within the CEA. A threatened ecological community of Subtropical and Temperate Coastal Saltmarsh was located immediately south of the CEA boundary. This subtidal community is unlikely to be impacted with no major infrastructure envelopes or activities planned in the CEA area immediately adjacent its location.

1. Introduction

The Department of Defence (Defence) contracted Jacobs to prepare an Environmental Baseline Condition Report (EBCR) for the proposed Cultana Expansion Area (CEA) adjacent the existing Cultana Training Area (CUTA), on the Eyre Peninsula, South Australia.

Defence proposes to expand the existing CUTA of 50,250 hectares (ha) at Cultana to approximately 209,294 ha (see EPBC referral 2010/5316). The site will expand to west of CUTA through the acquisition of the neighbouring pastoral leases of Tregalana, Roopena and partial acquisition of Lincoln Park, Pandurra, Katunga and Corunna. The proposed CEA is located approximately 300 km from Adelaide on South Australia's Eyre Peninsula. Port Augusta, Whyalla and Iron Knob are the closest major townships. The Whyalla – Iron Knob Road and the Lincoln Highway, which links Port Augusta and Whyalla, runs through the CEA and will continue to function in its current capacity (AECOM 2012a).

The Defence CEA proposal was approved by the Federal Minister for Environment, subject to a series of conditions. This EBCR document fulfils the terms of Condition 11 of the *EPBC Act* approval, describing the baseline condition of the environment at the CEA. This was achieved by undertaking:

- A desktop review of regional literature and data, including previous work undertaken at the existing CUTA, for the CEA Public Environment Report (PER), and other existing management plans contributing to the Environmental Management Framework
- A comprehensive baseline flora and fauna survey, including targeted species and community searches for EPBC listed species and threatening processes
- Ground-truthing of relevant environmental features and conditions that have been raised through previous desktop assessment.

1.1 Background

The Defence White Paper (DoD, 2013) provides guidance about Australia's long-term defence capability and outlines the strategic changes Defence is looking to implement on Defence Estates; primarily to consolidate existing units into fewer, larger and more sustainable multi-user bases *(*Department of Defence*, pp 46, 2013).*

The existing range at CUTA can only support limited defence training activities. This is a direct result of the size and topography / accessibility of the site which significantly limits large scale, joint and combined training activities.

The proposed expansion of CUTA will allow the operation of large, joint force training activities between sections of the Australian Defence Force. The CUTA expansion is critical to maintaining Defence's training requirements both now and into the future, and the proposed base is strategically aligned with the current Defence White Paper (2013). The land itself allows flexibility in Defence training, with multiple land types and a larger area, allowing versatility and large scale joint training activities to occur between sections of the Australian Defence Force and with allied overseas forces. The expansion will allow tri-service training facilities, close to the coastline and terrain that has been likened to conditions in foreign countries.

Defence has been investigating the expansion of CUTA since 2011, beginning with Indigenous and pastoral consultation. The *Lands Acquisition Act* (1989) required an Acquisition Declaration be made to the lease holder prior to the attainment of land for Defence purposes. Five of the pastoral leases were acquired by the Commonwealth on the 17 October 2012, with the sixth and final lease being acquired on 7 November 2012. The compulsory acquisition of these pastoral leases occurred after an Indigenous Land Use Agreement (ILUA) was made on the 15 September 2011. On the 28 June 2013, the CEA ILUA was registered by the Native Title Tribunal. The ILUA has a number of requirements, including the production of an Indigenous Heritage Management Plan (IHMP) and a Cultural Awareness Training Program (CATP).

On 5 December 2013, the Federal Minister for the Environment approved the Cultana Expansion Area Project subject to 23 conditions. Condition 11 requires a comprehensive monitoring and reporting on the environmental conditions, the production of an Environmental Baseline Condition Report (EBCR). This document (the EBCR)

fulfils the terms of Condition 11 of the *EPBC Act* approval, describing the condition of the environment at the CEA (described further in Section 1.3.1 below). These conditions have been given based on the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Native Title Act 1993*.

On the 20 June 2014, SA Government granted Defence the Miscellaneous Lease for Defence Purposes (MLDP), allowing Defence to develop the CEA as a training area subject to the conditions of the original approval. These conditions include production of a State of the Environment Report (SoE Report) that meets the requirements described in clause 9.2 and 9.3 of the MLDP, that draws on baseline information provided in the CEA PER and this EBCR. The SoE Report is being prepared concurrently (Jacobs 2015b).

1.2 Commonwealth Legislation

The applicable legislation relating to this project within South Australia is a follows:

*Environment Protection and Biodiversity Conservation Act, 1999 (*EPBC Act*)*

This Act prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas. Under the environmental provisions of the EPBC Act, actions that are likely to have a 'significant impact' on a matter of National Environmental Significance require assessment and approval by the Commonwealth Environment Minister. There are nine matters of national significance identified under the EPBC Act, including both Threatened species and Ecological Communities and Migratory species as listed under international agreements. These two matters of national significance will be investigated in this report as part of the conditions given.

Native Title Act, 1993

This Act recognises native title rights and sets down some basic principles in relation to native title in Australia. "Native title is the recognition by Australian law that some Indigenous people have rights and interests to their land that come from their traditional laws and customs" (National Native Title Tribunal, 2011a). It provides for the validation of past acts, provides protection for native title rights and provides a process by which native title rights can be established and compensation determined. Recently, the Federal Court has granted the native title claim to parts of the Eyre Peninsula by the Barngarla people. This native title claim covers the entirety of the CEA area.

1.3 Commonwealth Policies

The Commonwealth government is also guided by the following policies and strategies relevant to native habitats, communities and species:

- Australia's Biodiversity Conservation Strategy 2010-2030 (National Resources Management Ministerial Council 2010)
- Principles for Sustainable Resource Management in the Rangelands (DEWHA 2010)
- National Land and Water Resources Audit on Rangelands (NLWRA 2001)
- Australia's Native Vegetation Framework (COAG Standing Council on Environment and Water 2012)
- Australian pest animal strategy: A National Strategy for the management of vertebrate pest animals in Australia (NRMMC 2007)
- The Heritage Strategy (EPBC 1999)
- Discover Defence Heritage Initiative (Defence Corporate Strategy)

1.4 South Australian Legislation

Defence as a Commonwealth Government department is not obliged to meet State legislation. However, Defence enacts a good neighbour policy and aims to comply with state, territory and local government environmental legislation and requirements to the extent that these do not conflict with Commonwealth

legislative obligations. Defence will often actively participate in regional control programs of state legislated weed and pest species as part of this good neighbour policy.

1.5 Cultana Expansion Area

The CEA has been primarily used for agricultural grazing of livestock, with pastoral activity having occurred on the CEA for more than 100 years. Utility and transport corridors traverse through the site, including water and gas pipelines, power, telecommunications cables, rail corridors and commercial flight paths. The University of Adelaide has maintained a teaching and research station since the early 1980s on a pastoral lease within the CEA, and the Whyalla Gliding Club holds land adjacent the Lincoln Highway. In addition, a number of active and expired mining leases exist within the CEA. A site location plan showing pastoral leases and homestead locations is presented as Figure 1-1.

The CEA occurs across several council areas; Port Augusta (City), Whyalla (City) and Development Regions classified as 'Land Not Within a Council Area '(Eyre, Far North, Riverland and Whyalla). The site comprises the existing Tregalana and Roopena pastoral leases, and parts of the Lincoln Park, Pandurra, Katunga and Corunna pastoral leases. Broadly, the CEA supports open, sparse vegetation typical of semi-arid regions. Low open chenopod shrublands dominate the majority of the CEA, with *Acacia* shrublands, and remnant *Callitris* and *Casuarina* woodlands. Isolated pockets of spinifex (*Triodia* spp.) and mallee (*Eucalyptus* spp.) vegetation also occur on the CEA site. The majority of vegetation within the CEA is degraded, due to historical pastoral and agricultural use over the previous century.

Several detailed environmental studies have been undertaken at the site to date. Broad-scale vegetation descriptions and site characterisation has been undertaken in previous years (AECOM (formerly ENSR) 2006) and more detailed vegetation mapping was undertaken by AECOM (2012a). The ENSR (2006) site assessment was undertaken as a reconnaissance survey to the area east of the Iron Knob to Whyalla Road. Eight (8) mapping units were identified; Mallee, Arcoona Platea-Plateau, Arcoona Plateau-Slopes, Mount Whyalla Hills, Land subject to inundation, Black Oak Stands, Myall Woodland and Chenopod Shrubland. Detailed vegetation mapping by AECOM (2012a) used 31 vegetation units (Floristic Community Types) within the CEA site.

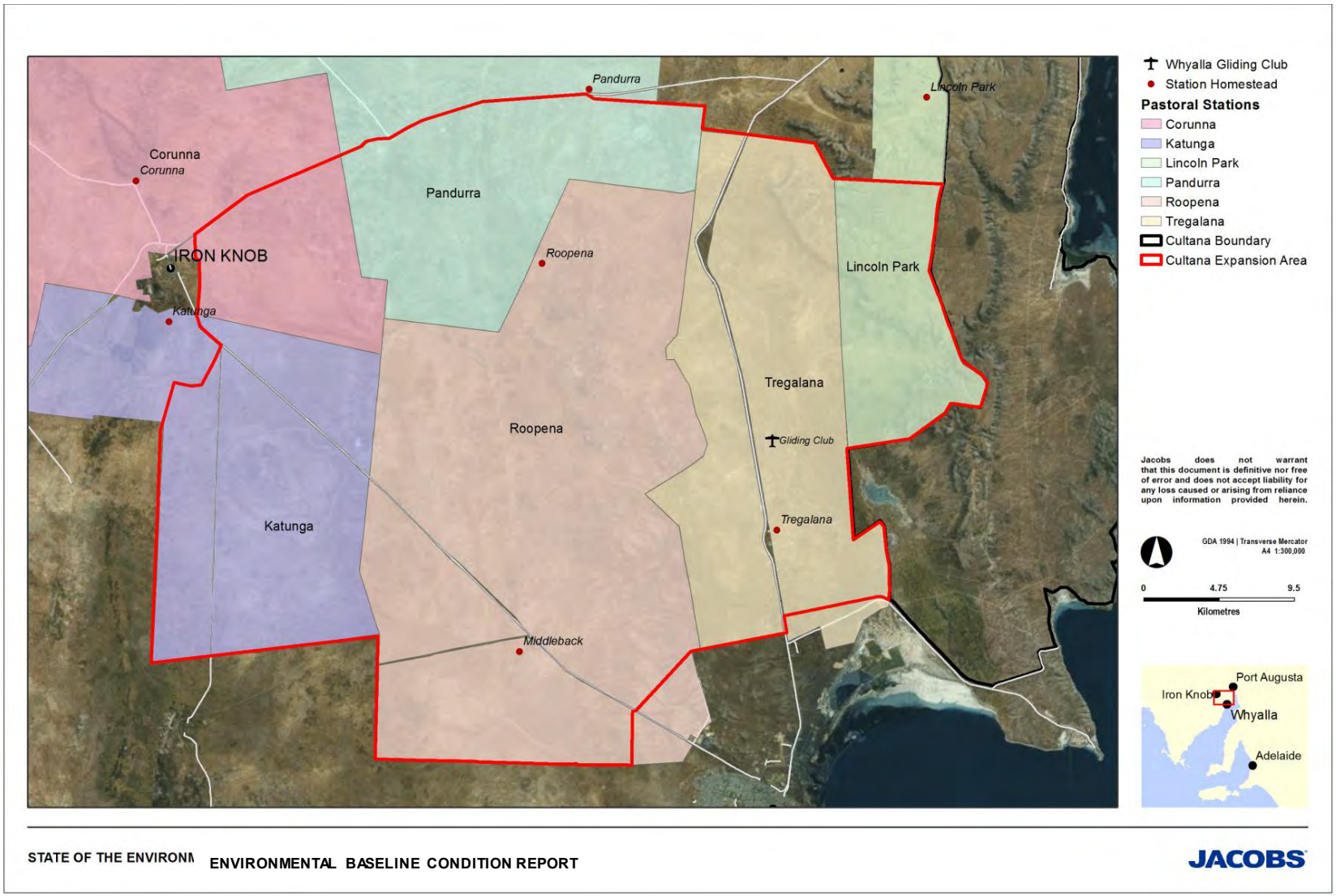

Figure 1-1 : Pastoral leases and homesteads of the CEA

1.6 Project Scope and Objectives

1.6.1 Scope

The scope of the project undertaken by Jacobs for Defence was to prepare an EBCR in accordance with the requirements of Condition 11 of Defence's EPBC Act approval (2013) for the CEA. Condition 11 of the EPBC Act approval prescribes that "*the EBCR must describe the condition of the environment at the CEA*". Table 1-1 below presents the terms of Condition 11 and outlines how each term has been assessed and where it is presented in this report (EBCR).

The information contained within this EBCR, along with the IHMP, will also directly advise the SoE Report (Jacobs 2015c). The baseline weed survey and targeted flora and fauna surveys for the EBCR expand on results of surveys conducted for the PER, primarily undertaking baseline fauna trapping (not undertaken for the PER) and targeted threatened species surveys including several EPBC and NPW listed flora and fauna noted in the Conditions of Approval (2014).

This EBCR will include a desktop survey of the landscape, soil and climate, as well as the results and outcomes of a comprehensive flora and fauna survey, cultural heritage assessment, and environmentally sensitive features including contaminated land, clay pans, highly erodible or saline soils, waterbodies and courses outlined in Condition 11 of the EPBC Act Approval and build on the baseline information provided by the PER.

Table 1-1 CEA Condition 11 terms and how they have been assessed and addressed in the EBCR

CEA EPBC Act Approval Condition 11 Terms	How Assessed?	Section of EBCR
a) comprehensive ground-truthed mapping of vegetation communities, using a relevant regional or statewide vegetation classification system	Desktop and field flora and fauna survey	Section 3.3.1 (methods) Section 7.2 (results)
b) descriptions of all vegetation communities occurring within the CEA, including information on key species, conservation status, soil, geographic and climatic preferences, relevant threats and general condition	Field flora and fauna survey	Section 7.2.2 (field survey results)
c) comprehensive ground-truthed mapping of environmentally sensitive features. including clay pans, contaminated sites and highly erodible or saline soils	Field assessment	Section 5
d) comprehensive ground-truthed mapping of waterbodies and watercourses (including floodplains) within the CEA	Field assessment	Section 6
e) comprehensive mapping (unless culturally inappropriate) of culturally significant sites and areas, based on local, state and Commonwealth heritage databases as well as consultation with relevant traditional owners	Indigenous Heritage Management Plan	Section 4 and Appendix C
f) identification of all weeds and pests identified on the site, and mapping of the distribution of prescribed/listed and major pest and weed populations	Desktop and field flora and fauna survey	Section 8
g) an inventory of all species known to occur within the CEA	Desktop and field flora and fauna survey	Appendix N (flora) Appendix M (fauna)
h) descriptions, justifications and limitations (e.g. due to climatic conditions) of survey methodology employed		Section 3 and Appendix A (fauna detailed) Section 9 (limitations)

1.6.2 Study objectives

This study will build on the results presented in the CEA PER (AECOM 2012a) and other background studies to provide a comprehensive baseline assessment that will address legislative requirements in the EPBC Act Approval Conditions, determine the likelihood of the presence of matters of national significance and provide technical input to the Environmental Management Framework and State of the Environment reporting also required for the site (a requirement of the MLDP). This study will also allow Defence to determine whether significant environmental constraints are present that will shape the future use of the CEA. Comprehensive mapping of vegetation communities, environmentally sensitive features, culturally significant sites, all invasive species, and an inventory of all species known to occur within the CEA has been produced to support this EBCR.

2. Study Area

The study area (CEA) comprises approximately 160,000 ha of land to the west of the existing CUTA range, therefore increasing the overall size of CUTA to over 210,000 ha when in operation. The closest localities are Port Augusta, 22 km to the north-east, Whyalla, 10 km to the south-east, and Iron Knob, 2 km to the north-west. The Whyalla-Iron Knob Road and the Lincoln Highway linking Whyalla and Port Augusta extend through the CEA. The Eyre Highway bounds the CEA to the north. Both access routes will continue to function in their current capacity when the CEA is approved for operation.

2.1 Bioregion

The study area resides in the Gawler bioregion, as defined by the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell 1995). Within this bioregion, there are 5 subregions including Myall Plains, Gawler Volcanics, Gawler Lakes, Arcoona Plateau and Kingoonya. The majority of the CEA is within the Myall Plains subregion (GAW1), however the eastern most extent is within the Arcoona Plateau subregion (GAW4) (IBRA Version 7). A summary of the key features of the IBRA subregions are presented in Table 2-1.

The Gawler Bioregion is characterised by rounded landscapes, rocky hills, plains and salt-encrusted lake beds. Vegetation is predominantly spinifex grasslands, open woodlands and chenopod shrublands. Sheep and cattle grazing is the most common industry in the area (utilising 83% of the land use). Mining activities occur nearby at Iron Knob, 2km from the boundary of the CEA.

Table 2-1 IBRA Sub-region Features (IBRA 7, DSEWPaC 2012)

	IBRA Sub-region	
Feature	**Arcoona Plateau (GAW04)**	**Myall Plains (GAW01)**
Landtype / landscape	Erosional plateau	Erosional, depositional or volcanic plain
Landform	Dissected sandstone plateau with bold eastern escarpment. Surface undulating to hilly and often gibber-covered, particularly in east.	Gently undulating calcrete plains and occasional hills. Includes a zone of salt lakes and gypsum dunes at Lake Gillies and steep strike ranges at the Middleback Ranges.
Geology	Sands,clays,silts; pallid zones & ferruginised breakaway scarps. Silcrete & silcrete skins; stony plains & plateau remnants. Colluvial fans,alluvial sands,silts,clays & gravels. Stony tablelands, gibber plains & stone circles (gilgai effects)	Calcrete development; gypsum dunes; play lakes with silt & clay deposits & evaporites
Soil	Crusty red duplex soils, red calcareous loams	Red calcareous earths, sandy soils with mottled yellow clayey subsoils
Vegetation	Chenopod shrublands	Assumed native vegetation cover
Climate	Semi-arid climate that is too dry to support field crops. Soil moisture tends to be greatest in winter	Semi-arid climate that is too dry to support field crops. Soil moisture tends to be greatest in winter

2.2 Historical Land Use

The CEA has been primarily used for agricultural grazing of livestock, with infrastructure still evident from this particular land use (e.g. water points and dams, tracks, fences, gates). Pastoral activity has occurred across the

CEA site for more than 100 years, at times becoming heavily overstocked. Multiple utility and transport corridors run through the site, including water and gas pipelines, power, telecommunication cables, rail corridors and commercial flight paths. The University of Adelaide has maintained a teaching and research station since the early 1980s on the Roopena pastoral lease, and the Whyalla Gliding Club holds land adjacent the Lincoln Highway from Whyalla to Port Augusta. In addition, neighbouring land uses include various active mining leases around the Iron Knob area, and tourism and accommodation associated with the Nuttbush Retreat on Pandurra Station. A number of active and expired mining leases exist within the CEA. The Commonwealth and State will allow mining and other activities on the CEA where they are align with Defence's use of the training area.

2.3 Proposed Land Use

A wide range of Defence vehicles, equipment and weapons will be used on the proposed CEA. It is expected the principle unit to train in the area will be the Army's 1st Brigade, and the 9th Brigade (Reserves) for less complex, smaller-scale activities. The frequency or scale of activities to be undertaken at CEA is not currently known, however it expected multiple activities including live firing, combined arms training as well as larger scale defence activities are likely to occur across the site. The major Defence users of the CEA and their activities are outlined in Table 2-2.

Table 2-2 Defence users and activities

Defence user	Activities
7TH Royal Australian Regiment (7RAR)	7RAR Battle Group commenced relocation from Darwin to the new purpose-built facilities at RAAF Base Edinburgh in January 2011. Over 800 members of the Battle Group are now operating out of the new facility. The Army presence at Edinburgh consists of the 7RAR mechanised infantry battalion equipped with upgraded M113 Armoured Personnel Carriers, a mechanised combat engineer squadron, a self-propelled artillery battery, a combat services support team and a detachment from the headquarters of the 1st Brigade.
4TH Royal Australian Regiment (4RAR)	4RAR will use the CEA for amphibious landing and covert operations and live ammunition firing.
1ST Brigade	1st Brigade will use the CEA for mechanised vehicle and infantry manoeuvres. Given the ease of relocation from Darwin via the Darwin-Adelaide rail link and despite some logistical issues, the 1st Brigade will use the training area as a dry weather training area
Special Air Services	Special Air Services will use the CEA for amphibious landing and activities such as personnel training, covert operations and live ammunition firing.
9TH Brigade (Army Reserves)	9TH Brigade will use the CEA for formation and sub-unit training, including live ammunition firing and the use of heavy vehicles, including road works.
RAAF and 16 Air Defence Regiment	The RAAF and the 16 Air Defence Regiment will use the CEA for driver training exercises
Defence units	Defence units will use the Cultana training area for driver training exercises
The Directorate of Training Areas, Regulations and Policy (DTARP)	DTARP is responsible for developing and maintaining Defence policy on the regulation and management of training areas throughout Australia and delivery and maintenance of the Defence Training Area Management Manual. DTARP sits within the Estate Planning Branch, Infrastructure Division.

Defence user	Activities
Directorate of Operations and Training Area Management (DOTAM)	DOTAM is the Training Area Management Authority for all training areas. On behalf of the Army DOTAM manages Defence Support and Reform Group (DSRG) range and training areas and facilitates access to non-Defence training areas.
DSRG - Defence Support and Reform Group (DSRG)	DSRG is the consolidated service delivery organisation for Defence. DSRG also maintains environmental stewardship of over 3 million hectares of land with more than 300 managed properties, and maintains and operates more than 25,000 buildings. Its responsibilities include supporting the ADF and the Department of Defence through the provision of legal services, personnel administration and related functions such as education, training and development, honours and awards, ADF housing, financial and travel services, and contracts that provide catering, cleaning and grounds maintenance services. DSRG manages and sustains the Defence estate of land, buildings and infrastructure, including managing contracts for the construction of major new facilities and the repairs and maintenance of existing facilities, as well as the disposal of excess properties and environmental heritage policy.
Private enterprise	Companies may use the training area as a training/proof and experiment range.
Contractors	Contractors engaged to construct facilities or deliver services within the boundary of the CEA.
Barngarla, Kokatha, Nukunu and Kuyani	Indigenous stakeholder groups have access rights to land within the CEA boundary under the terms of the ILUA and following Defence protocols via application to Defence.

2.4 Landscape, Geology and Soils

The PER provides a detailed review and assessment of the geology and soils of the CEA.

The geology of the CEA is comprised of eroded remnants of Adelaidean sandstone, siltstone and shale, overlain with unconsolidated sediments, and with hills of granitic morphic rock emergent centrally (Mt Whyalla) and along the eastern flanks (Simmens Plateau) of the site (AECOM 2012a). The CEA covers a relatively stable geological environment, with just over a dozen very small to small magnitude earthquakes recorded in the region over the past 20 years (**Table 2-3**). The most significant earthquake event recorded in this time is a magnitude 3.5 that lasted 43.5 seconds (1997). Earthquakes of the magnitude and duration commonly experienced in the CEA region are unlikely to cause significant structural damage or trigger landslides (Geoscience 2015).

Table 2-3 Recent earthquakes, CEA region[1]

Date	Magnitude	Duration (seconds)	GA ID[2]	Location description
16/09/1994	1.1	39.4	5809	South of Iron Knob
8/11/1994	1	13.8	5844	South-west of Iron Knob
24/01/1995	0.7	45.5	5973	South-east of RPA HS.
1/10/1995	1.9	16.5	6147	North of Whyalla
17/11/1995	0.7	0	6197	North of Whyalla
24/12/1995	1	56.3	6233	Douglas Point
22/05/1996	1	41.1	6308	Douglas Point

Date	Magnitude	Duration (seconds)	GA ID[2]	Location description
23/07/1996	2.3	42.2	6338	Whyalla
26/04/1997	1.1	9.3	6487	East of Roopena
21/07/1997	3.5	43.5	6523	26 km south of Port Augusta
25/09/1997	1.7	47.7	6546	19 km east of Whyalla
30/11/1999	1.8	44.5	6906	29 km north-east of Whyalla
6/07/2001	0.9	56.6	7144	32 km north-east of Whyalla
18/05/2008	1.4	45.4	8416	24 km south of Port Augusta
Average	1.4	36 seconds		

[1] Earthquake data extracted for the CEA region plus a 5 km buffer (Geoscience Australia 2014)
[2] Geoscience Australia Earthquake ID number

The PER provides a review and assessment of the soils of the CEA based on a land condition survey undertaken in 2010 (AECOM 2012a) and reconciled against observed vegetation types. Soil description results taken as part of the flora and fauna survey (Jacobs 2014) were consistent with soil mapping prepared by AECOM (2012a). Finer scale soils mapping is not available for the CEA, but is expected to vary widely in type and texture. More broadly, the CEA soils may be classified as reddish gravel, sand, silt and clay forms around rocky outcrops interspersed with areas of gypsum-rich and salty sand, silt and clay from existing and historic salt lakes and creeklines.

AECOM (2012a) predictively mapped upper horizon soil descriptions (i.e. A horizon). The A horizon soil layer is the most vulnerable to future land uses, and can be summarised as:

- Predominantly clay-loam soils, with sandier clay soils appearing to the south in association with a large ephemeral drainage system, and heavier clay soils appearing to the north-west and south.
- Sandy soils in association with Mallee (EBCR field survey study sites of Flora Fauna 3 and Flora Only C in the south-western and eastern edges)
- Gravelly, shallow soils associated with upland areas (Mount Whyalla and Simmens Plateau)

2.5 Climate

The CEA has a climate dominated by semi-arid zone conditions, characterised by hot dry summers, and mild dry winters. Average Whyalla temperatures (south of the site) range from 30.2°C in January to 16.9°C in July (BOM 2015, see Figure 2-1 below,). Average total annual rainfall is 262.3 mm at Whyalla, becoming significantly drier heading north through CEA to Port Augusta, with an average total annual rainfall of 218.6 mm. Source: Whyalla Aero (018120, 1945-2014) and Port Augusta Aero (018201, 2001-2014).

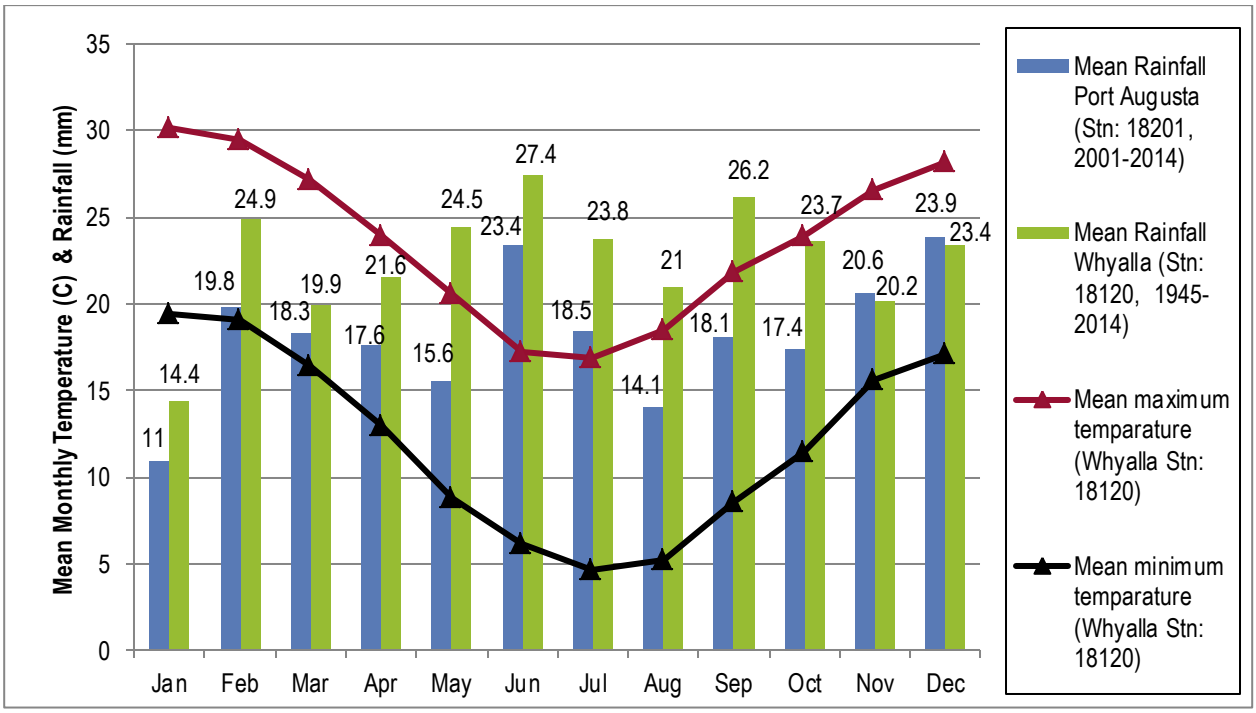

Figure 2-1 Average climate statistics for Whyalla (Stn 18120) and Port Augusta (Stn 18201) bounding the CEA (BoM 2014)

3. Methodology

3.1 Cultural Heritage Assessment

3.1.1 Baseline desktop review – Indigenous

Between 2007 and 2014 three stages of Indigenous cultural heritage clearance surveys ICHS1 (ENSR 2007), ICHS2 (AECOM 2012b) and ICHS3 (AECOM 2014) were undertaken to identify archaeological and anthropological sites, and assess the cultural heritage values of the CEA as presented in Appendix B of the IHMP (Jacobs 2015b). A full review of these Indigenous heritage assessments ICHS1-3 is provided in Appendix B of the IHMP which, although not appended to this report, may be available on request from Defence. Some information contained with the IHMP Restricted Area (RA) tables is confidential in nature and is not provided following consultation with the relevant Indigenous stakeholders who participated in the cultural heritage assessments.

An archaeological survey of the CEA resulted in 55 archaeological sites being recorded (including reinspection of two of the three previously registered Indigenous places within the CEA) and an area of potential archaeological deposit being recorded (ACHM 2006). The archaeological sites comprised 52 artefact scatters including two artefact scatter/stone arrangements and two quarries. Reinspection of a further two previously recorded sites occurred although a further previously recorded site could not be relocated. Subsequent ethnographical assessments resulted in 92 men's sites and 24 women's sites being recorded in the CEA (AECOM 2012b; AECOM 2014; ENSR 2007b).

A revised search of the Commonwealth heritage registers was undertaken on 6 November 2014 to confirm previously reported existing Commonwealth heritage values within the CEA (AECOM 2012b). There are no Indigenous heritage sites within the CEA listed on the World Heritage List (WHL), the NHL or the CHL. Gilmore's Well (RNE 6960) is an Indigenous Place on the Register of the National Estate (RNE). The RNE ceased to function as a statutory register in February 2012 and has a non-statutory status. The results of the Commonwealth heritage searches are presented in Table 3.1 of the IHMP. The Aboriginal Affairs & Reconciliation Division (AARD) Central Archive (SA Department of State Development) was also searched on 6 November 2014 to determine if sites had been registered in the CEA since the 2007 assessment (ICHS1). Only one archaeological site (Central Archive 6432/4698) was recorded in the CEA. The previously recorded Indigenous sites Tregalana 1 (6432/3399) and Tregalana 2 (6432/3398) revisited during the 2007 archaeological assessment (ICHS1) were determined to be outside the final MDLP lease boundary for the CEA. It was also established that the 52 sites recorded during the 2007 assessment (ICHS1) were not registered on the Central Archive and within the CEA.

3.1.2 Baseline desktop review – Historical

While no systematic historical heritage survey by heritage professionals has been undertaken for the CEA, prior desktop assessments (AECOM 2012a; Woodhead International 2006 for the existing CUTA) and additional historical research undertaken for the SoE Report (Jacobs 2015b) provided further information on the type and nature of historical heritage places likely to be found in the CEA. The background assessment undertaken for the SoE Report (Jacobs 2015b: Sections 4.3.3-4.3.4) is summarised below.

- The area between Port Augusta and Whyalla has seen only sparse occupation by non-Indigenous settlers between 1888 and the present.
- The first non-Indigenous contact with the area came in 1802, when Matthew Flinders sailed into the head of Spencer Gulf in the *Investigator*.
- The process of land exploration commenced with Edward Eyre in 1839 and 1840 when he traversed the interior of Eyre Peninsula on two expeditions, but most expeditions into the interior travelled up the Flinders Ranges on the relatively well-watered eastern shore of Spencer Gulf, ignoring the arid western shore.
- In 1840, explorer Edward John Eyre discovered Iron Baron or Iron Prince and identified the area as principally comprising ironstone.

- Discovery of underground resources started the development of Iron Knob and Whyalla and established Broken Hill Proprietary (BHP) as one of the largest companies in Australia (Flinders Range Research 2015a, 2015b; Iron Knob Progress Association 2011).
- Initially, the ore was taken from Iron Knob and surrounding areas by bullock teams to Port Augusta and loaded on barges for transport to the Port Pirie smelters. Shipments of iron ore were also made from Hummock Hill (later known as Whyalla) to Port Pirie by barge.
- In 1901, work began on a private narrow gauge railway line, from Iron Knob and Iron Monarch to Hummock Hill (Whyalla). This narrow gauge railway still remains in use for iron ore transport through the CEA between Iron Knob and Whyalla, with a branch line between Iron Baron and Middleback (Flinders Range Research 2015a, 2015b; Iron Knob Progress Association 2011).
- There is potential for the remains of early mining activities, machinery and camps to be present on CEA. There also may be remnants related to the construction of the Iron Knob to Whyalla railway, such as construction workers camps. Components of the railway itself, such as culverts, may also be of heritage value.
- In 1851, pastoral leases were introduced to encourage grazing. The government established Port Augusta at the head of Spencer Gulf in 1854 to service the region. Port Augusta increased in importance with the construction of the Overland Telegraph in 1870 and the Great Northern Railway in 1879 (Woodhead International 2006)
- The first pastoral occupation on the western shore began around the later site of Whyalla in 1854 when Thomas Patterson took up Iron Knob. Wilsdon and Brook, graziers, took up the Cultana Run in 1888 and built their homestead near the head of Fitzgerald Bay (Manning 1990). In later years, the Point Lowly and Lincoln Gap runs to the north occupied the gulf coast as far as Port Augusta (Stanton 1996:5).
- The CEA comprises a number of historical pastoral stations dating to the late 19th and early 20th century, including Tregalana, Roopena, Middleback, Lincoln Park, Katunga and Corruna South (homestead complex is located outside the CEA boundary)

A review of the National Heritage List, RNE and South Australian Heritage Register conducted on the 6 November 2014 indicated that there are no historical heritage sites listed within the CEA.

Due to the expansion of the CUTA, Defence has acquired a number of pastoral leases upon which are approximately 42 buildings and structures located at Middleback Homestead, Roopena Homestead, Tregalana Homestead and Whyalla Gliding Club which have been identified as in poor condition and/or not fit-for-purpose and are proposed for demolition. As no prior heritage assessment had been undertaken for these pastoral complexes, Defence agreed that a historical impact assessment and archival photographic recording report be prepared prior to the proposed demolition works (refer Section 0).

3.1.3 Gap Analysis

A gap analysis of the Indigenous heritage assessment indicates that while a number of archaeological and anthropological assessments have been conducted (ICHS1-3), large, potentially less sensitive areas of the CEA have not been systematically surveyed (Jacobs 2015a, Figure F-2). As digital polygons were not available for some archaeological site boundaries (CEA Indigenous sites 1-55), the sites were digitised from the ICHS1 PDF map tiles (HLA ENSR 2007b). Given the use of handheld GPS and manual digitisation using known locations in SA 50k topographic map base layers, the accuracy of CEA site boundary digitisation for the RAs is approximately +/- 100 m.

To date, there has currently been no overall systematic assessment of historical heritage values across the CEA including completion of a Historical Heritage Management Plan. A broad historical heritage field assessment across the CEA has not been undertaken to include assessment of non-pastoral heritage, pastoral fences and watering points beyond the areas discussed in Section 0.However, a historical desktop review has been provided within the existing SoE Report (Jacobs 2015b) and further heritage impact and photographic assessment has been undertaken for key pastoral complexes within the CEA (Section 0). To manage proposed impacts on these historical heritage values, a historical heritage impact and photographic archival recording

assessment for the proposed demolitions of the Tregalana, Roopena and Middleback pastoral homesteads and the Whyalla Gliding Club has been completed (Section 0).

3.2 Assessment of environmentally sensitive features

In order to comprehensively assess the presence and extent of environmentally sensitive features across the CEA, as described in Condition 11 of the EPB Act Approval, a staged approach to the assessment was undertaken. The approach included the following:

- Preliminary desktop review of existing information relating to contaminated sites, the presence of clay pans, and the presence of highly erodible or saline soils across the CEA
- Detailed desktop assessment of clay pans and highly erodible or saline soils using remote sensing techniques
- Ground-truthing of environmentally sensitive features through a number of site inspections undertaken by Jacobs personnel
- Review, update, and validation of remote sensing results based on observations from site inspections

The following sections describe the above methodology in further detail.

3.2.1 Preliminary desktop review

A desktop review of available reports relating to the CEA was undertaken in November 2014, prior to the first site inspections being undertaken. Further desktop reviews were undertaken between December 2014 and February 2015 as relevant information and reports became available. The below documents were consulted as part of the preliminary desktop review:

- *Public Environment Report* (AECOM 2012a)
- *Indigenous cultural heritage clearance Cultana training area expansion: Eyre Peninsula, South Australia, ethnographic cultural heritage surveys stage 2* (AECOM 2012b)
- *Environmental Impact Assessment and Baseline Study Cultana Training Area Expansion, South Australia* (HLA ENSR 2008b)
- *Baseline Environmental Study, Cultana Expansion Area, SA* (HLA ENSR 2008a)

A review of these reports was undertaken to provide preliminary information with respect to the potential location of environmentally sensitive features across the CEA.

3.2.2 Detailed desktop review

Following the preliminary desktop review, a more detailed desktop review of the potential location of environmentally sensitive features was undertaken by completing a comprehensive review of available aerial imagery covering the CEA and, with respect to identifying clay pans and highly erodible or saline soil, by employing remote sensing techniques to identify areas for ground-truthing.

The remote sensing techniques used for this project comprised importation of SPOT 4-band satellite imagery, supplied as raw TIFF images, into Erdas Imagine. Unsupervised classification was performed to produce 50 classes of land cover. The land cover classes were visually examined and refined to assist in mapping areas of clay pans and bare earth regions. The classified output was ground-truthed to the known clay pans and saline soils (i.e. the salt lake present in the northern portion of the CEA) within the CEA. The classification results were then imported into ESRI ArcGIS showing a consistent classification colour scheme. Areas of potential misclassification were identified and flagged for field verification.

3.2.3 Ground-truthing and validation of remote sensing results

The results of the desktop reviews were used to define sites that required ground-truthing to confirm classification as an environmentally sensitive feature. Ground-truthing consisted of physically visiting the

locations in question to view the feature and update the classification of the feature, as required. During ground-truthing, opportunistic observations were also made of any environmentally sensitive features that may not have been identified as part of the above mentioned preliminary or detailed desktop reviews. Where features had been inspected and classified through previous surveys undertaken across the CEA, these features were typically not re-inspected to confirm classification (i.e. these features were assumed to have previously been ground-truthed).

Due to site access restrictions, safety considerations and / or time limitations of the project, not all sites identified as potential environmentally sensitive features as part of the desktop studies were able to be ground-truthed. However, more than 90% of sites identified as potential environmentally sensitive features (excluding watercourses) were able to be inspected on-ground with the results used to validate and, where necessary, update the remote sensing results for those sites not inspected on-ground.

3.3 Flora and Fauna Assessment

3.3.1 Desktop review

A desktop review of relevant literature and databases was completed in early November 2014 prior to the field survey. The desktop review involved evaluation of:

- The *Environment Protection and Biodiversity Conservation (EPBC) Act* Protected Matters Database maintained by the Australian Government's Department of the Environment (DotE). This database includes mapped locations of World Heritage properties, Ramsar listed wetlands, and modelled distributions of Commonwealth Protected Species (e.g. threatened, migratory and marine listed species), threatened ecological communities and protected areas and any other matters covered by Commonwealth Environmental and Heritage legislation. Species classified as migratory and protected under the EPBC Act by bilateral agreements, include the Japan-Australia Migratory Bird Agreement (JAMBA); the China-Australia Migratory Bird Agreement (CAMBA); and the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).
- The Biological Database of South Australia (BDBSA) flora and fauna records provided to the SA Government (Department of Environment Water and Natural Resources) as part of permit requirements to undertake survey work and include data from the following sources.
- South Australian Herbarium
- Birds Australia
- South Australian Museum
- General distribution texts and regional publications (e.g. Pobke 2008, Brandle 2010)
- Information published by the South Australian and Commonwealth Governments, including the online database of DotE (e.g. Species Profile and Threats fact sheets)
- Information available from relevant local authorities

A search of protected fauna and flora species that 'may occur' within the project area was conducted using the EPBC Act Protected Matters online search tool including the study area and a buffer of 5 kilometres. This high level data is based on current and historical species distributions, habitat requirements, migratory paths, and historical records. The results from such searches are not necessarily based upon current distribution and are therefore indicative only and should not take the place of on-ground investigations in terms of identifying the actual faunal composition of a site.

The BDBSA database searches incorporated a 50 kilometre buffer around the CEA boundary. The data includes historic flora and fauna records, including threatened flora and fauna. The buffer search area allows for a greater spread of fauna and flora survey records across comparative landscapes to the area of interest, and provides a greater dataset for analysis in a region where there is a paucity of records. Such data can provide a realistic indication of species potentially present in the study area.

3.3.2 Gap analysis

Two vegetation studies have occurred within the CEA. High level vegetation descriptions and physical site assessments were undertaken by ENSR (2006) for part of the CEA. ENSR (2006) used a helicopter to assess the vegetation, topography, geology, soils, inundation, past grazing history, current disturbances, cross fence differences and above ground infrastructure. Following this, more detailed vegetation and physical landscape characterisations were undertaken by AECOM (2012a), where 31 separate vegetation units (Floristic Community Types) within the CEA were described.

Two bird surveys have been conducted within and close to the CEA. An avian fauna survey was conducted at the CUTA Defence base in 2006 (ENSR 2007a), which identified 78 bird species. A total of 74 bird species were also recorded within a study area that included the CEA (Black *et al.* 2009).

To date, determinations of the mammals and reptiles of the CEA has occurred primarily through desktop assessment, with no targeted animal surveys occurring. The results of the comprehensive fieldwork undertaken for this EBCR will build on the previous vegetation characterisation of the CEA (AECOM 2012a) and the previous bird surveys (ENSR 2007a; Black *et al.* 2009).

3.3.3 Field survey

The CEA is located in an historical agricultural region characterised by open, sparse vegetation typically found in the semi-arid zone. A wide variety of vegetation types habitats have been characterised within the site, and these provide a wide variety of habitats for fauna. Identification of the vegetation communities, flora and fauna species (common and conservation significant), and the weeds and pests of the region is important for the long-term environmental management of the site. A flora and fauna survey was undertaken November 2014 to provide a comprehensive baseline condition assessment of the CEA; and results are presented below. A range of standard South Australian Biological Survey methodologies were employed across six sites (Heard and Channon, 1997; Owens 2000). The survey involved flora surveys and fauna trapping, identification of environmentally sensitive features, as well as active searches for conservation significant fauna and invasive species.

3.3.3.1 Permitting

Undertaking ecological research and handling / trapping of animals in South Australia can only legally be undertaken with relevant permits and licences in place. Relevant permits and licences were obtained prior to field survey commencement. Due to the research being conducted on Commonwealth Land, a Permit to Undertake Scientific Research was not required. All works were undertaken in accordance with the following permit and licence conditions:

- Project Specific Animal Ethics Committee Approval:
  - Application number 39/2014, approval period 30/10/2014 to 31/12/2014
- Licence for 'teaching, research or experimentation involving animals':
  - Licence # 228 Expiry: 31/09/2016
- Licence to 'possess and administer an S4 drug'[1]:
  - Licence # 2014-81802 Expiry: 31/05/2015

[1] A condition of Scientific Research Permits is that 'best practice' for biological survey work is undertaken, including vouchering of specimens of interest for the South Australian Museum (SAM). This condition is included on permits as a means of maximising value obtained from survey work across the State, to enable taxonomic specialists the chance to verify field identification, and to encourage survey records to be included in the Biological Database of South Australia for broader knowledge. While not required to have a Scientific Permit, the project team liaised with the SAM prior to undertaking the survey to ascertain whether the Museum had particular interest in the region being surveyed. In this case, the curator of mammals and of reptiles requested voucher specimens and liver tissue samples be collected for target species. Pentobarbitone sodium was used to euthanize specimens.

All field surveyors were trained and well versed in biological surveys.

3.3.3.2 Site selection

Effective survey of flora and fauna across a broad area involves detailed survey of all major habitat types within the study area. Based on this, a preliminary site selection process was undertaken using aerial imagery and the past vegetation mapping undertaken by AECOM (2012a) to capture all broad habitat types potentially impacted by the proposed exploration operations. A GIS data layer of existing detailing vegetation mapping from AECOM (2012a) was overlain with aerial imagery, existing tracks, existing pastoral land infrastructure and water points. This allowed consideration of site access whilst targeting broad habitat types for fauna surveys. Following this initial site selection process, suitable field method and preliminary sites were agreed upon by Jacobs and Defence.

Final site selection was undertaken by the field team on the 17th and 18th of November 2014. This process was aimed at specifically identifying representative habitats for the survey sites that were indicative of the habitat type each site was targeting. In addition, site access and cultural sensitivity was considered. Broadly, sites were located in Chenopod shrubland, Black oak open woodland, Myall open woodland, and mallee open woodland. These vegetation communities were used to target nationally threatened species that may occur on site, and to map communities of conservation significance.

Details of the final survey site locations are listed in Table 3-1 and shown in Figure 3-1, below. Flora and fauna surveys were undertaken at Fauna and Flora sites 1-6 (FF1-FF6). Additional targeted flora surveys (i.e. no fauna survey) were undertaken at sites A and C. Although highly disturbed agricultural land was prevalent within the survey area, opportunistic fauna and flora observations were also made throughout the survey. Further information regarding the field survey methodology is provided in Appendix A.

Table 3-1 Site locations on CEA

Site Number	Easting	Northing	Broad Habitat Description
FF1	738517	6370205	Chenopod and lignum plain
FF2	734468	6379220	Black oak open woodland over chenopod
FF3	744093	6366828	Mallee chenopod sandy plain
FF4	719962	6352289	Blackbush/Bluebush broad drainage line/alluvial plain
FF5	723168	6358061	Myall low open woodland over pearl bluebush and bladder saltbush plains
FF6	717546	6361724	Bladder saltbush calcareous plain
A	739907	6381066	Stony plateau, *Melaleuca pauperiflora/Maireana sedifolia* open shrubland over *Triodia* hummock grassland.
C	746673	6354938	Mallee open woodland over chenopod and *Cratystylis*.

Figure 3-1 Flora and fauna survey sites in the CEA

3.3.4 Fauna and flora sites

Field surveys for sites 1-6 involved comprehensive fauna surveys, habitat and landform descriptions, detailed survey of vegetation monitoring plots, land impact assessments and upper horizon soil descriptions, in line with the requirements outlined in the South Australian Biological Survey Guidelines (Heard and Channon 1997, Owens 2000). Table 3-2 below outlines broad survey methodologies employed to collect ecological information for the flora/fauna combination sites established within the project area. Further details regarding fauna specific methodologies for each of the survey components are provided in Appendix A.

Table 3-2 Survey components of the 2014 CEA flora and fauna survey (sites 1-6)

Component	Target
Vegetation assessment at flora and fauna sites - establish and survey approx. 100 m square plot - Invasive species searches	Vegetation community description (including inland salt pan communities), threatened flora species, pests and weeds
Physical and Landscape description	Upper horizon soil characterisation, biological crust, underlying geology / topography – overall habitat, erodible or saline soils
Nights and day trapping (Pitfall trapline, Elliott traps, cage traps, funnel traps)	Terrestrial mammals and reptiles
Nocturnal spotlighting and 'eyeshine' searches, call playback, ANABAT recording	Targeted species, including nocturnal mammals (including bats), birds and reptiles (geckos)
Diurnal active and opportunistic reptile search / capture and scat and track searches	Reptiles, mammals, birds
Morning and afternoon bird surveys (audio / visual)	Birds
Targeted Threatened Ecological Community Surveys	EPBC listed Threatened Ecological Community of Subtropical and Temperate Coastal Saltmarsh
Mallee Searches	EPBC listed Malleefowl

3.3.4.1 Detailed flora survey and landscape description methods

Detailed vegetation surveys were undertaken at all eight sites (1-6, A and C) to investigate dominant vegetation structure and landform. Methodologies broadly followed those presented in *A Guide to Native Vegetation Survey; Using the Biological Survey of South Australia* (Heard and Channon 1997). This was undertaken to provide an inventory of species present, to note the occurrence of threatened species or assemblages and to provide detailed habitat information.

Floristic and landscape information was recorded for each flora survey site; information recorded included:

- GPS Coordinates using a hand-held 12-satellite GPS set to GDA94 (accuracy around $\pm$ 5 m)
- General Site description
- Description of physical environment
- Description of the level of disturbance, if any
- Vegetation classification and all species present identified
- Fire history and impact
- Evidence and extent of weeds and feral animals
- Soil, rock, crust and groundcover description including assessment of erodibility and vulnerability of soils

- Digital photograph numbers
- Any other relevant information

In addition to survey of the characteristics listed above, reference photographs were taken at each site, in each of the four compass bearings (N, E, S, W). These images are presented in Appendix B.

Any indigenous plant species that could not confidently be identified in the field were sampled and preserved using plant presses for later identification and / or for independent identification by the SA Herbarium in Adelaide. Field identifications of plant species were made using a variety of taxonomic keys, books and reference materials, including:

- Acacias of South Australia (Whibley and Symon 1992)
- Flora of South Australia Vol I-IV revised (Black 1986)
- Field Guide to Eucalypts – Volume 2: South-western and Southern Australia (Brooker and Kleinig 2001)
- Grasses of South Australia (Jessop et al. 2006)
- Plants of Western New South Wales (Cunningham et al. 1993)
- Weeds of the South-East; An Identification Guide for Australia (Richardson et al. 2007)
- AusGrass: Grasses of Australia (Sharp and Simon, version 1.0, 2002)
- EUCLID: Eucalypts of Australia (Centre for Plant Biodiversity Research, 3rd edition, 2006)
- Wattle: Acacias of Australia (Maslin, version 1.0, 2001).

Additional target weed searches outside of study sites and active searches for state and nationally listed flora species and TEC occurred was also undertaken and at a number of locations, based on historical site information.

3.3.5 Evaluation of conservation significance

The conservation significance of flora, fauna and habitats recorded during this survey within and surrounding the project area was assessed with reference to:

- species classified as threatened Nationally in accordance with the EPBC Act
- species classified as migratory in accordance with the EPBC Act
- species classified as threatened in South Australia in accordance with the NPW Act (as amended in 2000).

In addition, exotic flora were assessed as to whether they were considered to be Weeds of National Significance (WoNS) or particularly important to the region as per the outputs of the EPBC Protected Matters Search Tool, and BDBSA Data. A search radius of 50 km was used for these tools to account for any regional variation.

4. Culturally Significant Sites

4.1 Indigenous

An archaeological survey of the CEA resulted in 55 archaeological sites being recorded (including reinspection of two of the three previously registered Indigenous places within the CEA) and an area of potential archaeological deposit being recorded (ACHM 2006). The archaeological sites comprised 52 artefact scatters including two artefact scatter/stone arrangements and two quarries. Reinspection of a further two previously recorded sites occurred although a further previously recorded site could not be relocated. Subsequent ethnographical assessments (ICHS2-3) resulted in 92 men's sites and 24 women's sites being recorded in the CEA (AECOM 2012b; AECOM 2014; HLA ENSR 2007b).

Following the ICHS2 heritage assessment, Barngarla representatives noted that there are artefacts located throughout the CEA and those artefacts do not constitute an unusual or major artefact site so as to require preservation of those artefacts in their current location (AECOM 2012b). While the level of cultural heritage significance of archaeological sites from the ICHS1 clearance survey has not been denoted in the IHMP (CEA sites 1-55; Appendix E),under the South Australian *Aboriginal Heritage Act* 1988 however, these sites are afforded protection and are to be managed in accordance with the requirements of the ILUA.

As a result of consultation following the ICHS2 heritage assessment, the Barngarla noted three major areas within the CEA for which they require the highest possible protection (AECOM 2012b):

(a) Gilmore Caves at Tregalana;

(b) Red Rock and Tank Hill (Site 1) at Roopena;

(c) Mt Whyalla.

During the ICHS1-3 cultural heritage assessments the Indigenous stakeholders determined that information on culturally significant sites would be available as follows:

- Category A sites were to be seen by ENSR (and anthropological representatives only) and to be presented in a sealed section
- Category B material may be given to Defence and is incorporated into a sealed section of the ENSR report with restrictions applied by the source Indigenous group, but which may not be given to any other group
- Category C site information that is open and may be circulated to other Indigenous groups and to certain Defence personnel subject to agreed restrictions advised by the source Indigenous group
- Category D information which is not confidential.

Full details of culturally significant sites are listed within the RA register (Appendix E) of the IHMP (Jacobs 2015a). An overview figure showing the RAs is presented as Figure 4-1. Further detailed maps (provided as map tiles) are provided in Appendix C.

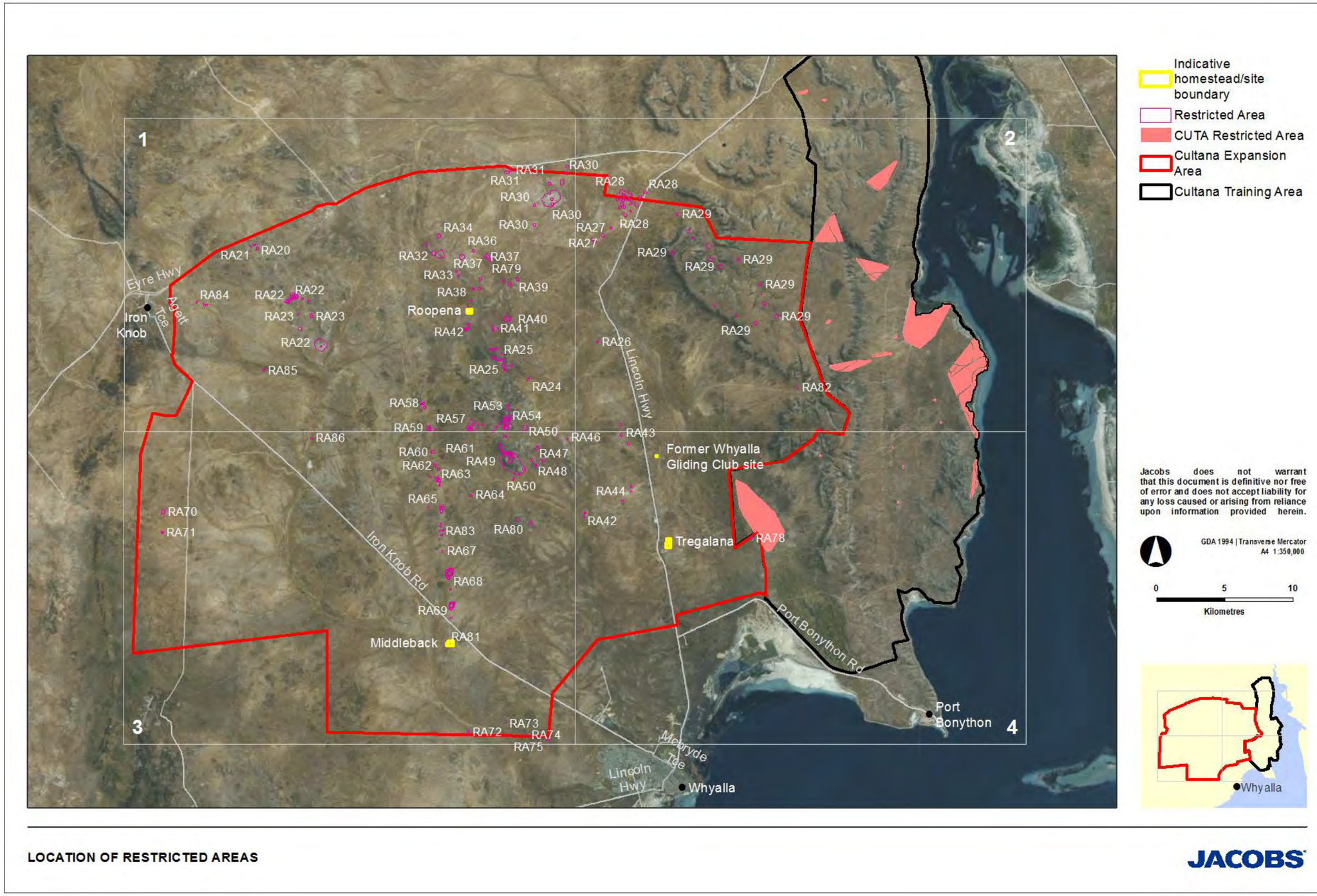

Figure 4-1 Location of Cultural Restricted Areas overview

4.2 Historical Heritage

4.2.1 Historical heritage assessment

A historical impact assessment of the proposed demolition of three homesteads (Roopena, Middleback, and Tregalana,) and the Former Whyalla Gliding Club was undertaken during the 23-27 February 2015. The extent of each pastoral complex was determined spatially via assessment of built structures from aerial imagery and a rectilinear boundary established to define the extent of assessment. Pastoral fencing and water infrastructure was not within the assessment scope. A historical impact assessment of pastoral complexes is currently in preparation (by Jacobs). Given the proposed timeframe for demolition, Defence also requested an archival photographic record to be undertaken as a mitigation process following the impact assessment. The archival photographic report is currently in preparation. The initial results of the heritage impact assessment are summarised as follows:

Roopena Station

The key buildings and structures recorded at Roopena include the main homestead (1954), second dwelling (1960s, with extension in 1989), 'Robert Lange' Cottage (mid 1980s), workshop, lubricant shed, garage/storage buildings, laundry/storage, school room, crutching shed, old blacksmith's shop, pens, fencing, garden areas around main homestead, yards, dams, well, tanks, trough, and windmills (refer Figure 4.2 and Appendix C). A stone fireplace/oven was recorded south east of the main pastoral complex at Roopena (Appendix C). This structure appears to pre-date the existing 1954 homestead and surrounding structures. Further archaeological potential may exist in proximity to this structure.

The gravesites of Susan Rozzi and John Jervoise at Roopena mentioned in the AECOM 2012a PER report were not relocated during the heritage impact assessment, however Defence are aware of their location near the dam located in proximity to the Roopena pastoral complex (Sergeant John Swensen, pers.comm 3 March 2015).

Middleback Station

Historical field assessment of Middleback Station confirmed the SoE Report desktop review (Jacobs 2015b). Middleback The heritage assessment recorded a main Middleback homestead (1956, with additions in the mid1960s), second homestead (homestead dating to 1926, renovated 1973), quarters, meat house/store, car/bike shed, vehicle shed, two shearers quarters, shower block, toilet block, blacksmith's shop, sheep drying shed, woolshed, fowl run, dog kennels, old telegraphic battery storage room, and cart shed (refer Figure 4.3 and Appendix C). Two sets of timber stockyards – one for bullock handling and the other for horse yards – were described as being 'historic' by the valuer (Colliers International 2012b) and were subsequently recorded during the archival photographic assessment (refer Appendix C for photographic plates). In 1933, the Middleback woolshed was recorded as a large galvanised woolshed with a boarded floor and an eight stand shearing machine as mentioned in newspapers of the time (refer Figure 4.3 and Appendix C). An earlier homestead at Middleback (described in 1933 as the 'original' homestead) appears to have existed in close proximity to the 1926 homestead but no trace of archaeological remains of the earlier structure were recorded.

An archaeological deposit (surface historical artefact scatter) of approximately 20 m x 10 m was recorded west of the eastern shearers quarters on the station. This potential archaeological deposit is approximately 0.75 m high consisting of late 19th/early 20th century ceramic and glass fragments, shell, cut bone, metal containers and includes a ceramic pipe stem fragment. Further archaeological potential exist in proximity to this structure.

Tregalana Station

The key buildings and structures recorded at Tregalana include the main homestead (Gebhardt's1930 stone building house, with extensions from the 1980s), a manager's house, storage shed, meat shed/coolroom, aircraft hangar, shearer's quarters, woolshed, other sheds and outbuildings, old rainwater tanks, old fuel bowser, cattle yards, dams, concrete and corrugated iron water tanks, and windmills (refer Figure 4.4 and Appendix C) (Colliers International 2012a). The homestead, woolshed and the surrounding outbuildings are of historical significance as they demonstrate an ongoing use for the operation of the key historical activity of the

region, pastoralism. The Station has a strong association with the Gebhardts, an important South Australian family, and a long term association with the Nicolson family who were key figures in the development and innovation of the wool industry in the region. The Station demonstrates the principal characteristics and layout of a large, remote sheep property dating from the early 20th century. The recorded woolshed has been modified given the last shearing occurred in 2013, however elements of the structure can be dated prior to the mid-20th century. A working dog cemetery is also located within the pastoral complex.

Former Whyalla Gliding Club

At the Former Whyalla Gliding Club, a galvanised steel frame hangar, a besser brick clubhouse, a brick toilet block and associated galvanised sheds were recorded (refer Figure 4.5 and Appendix C). The galvanised steel hangar may have been relocated from the Tregalana homestead according to Defence (Sgt John Swensen, pers.comm 3 March 2015). Defence also informed that the airstrip of the Whyalla Gliding club is approximately two km long which suggests earlier preparation of a runway for Defence purposes rather than construction for post-war recreational flying. Surrounding the gliding club is a 10 m x 15 m rubbish dump with associated metal drums, a 1960s Holden car body and assorted metal features (old caravan) and communications tower for the club. The level of heritage significance of the gliding club is subject to further background assessment but is likely to be only of local significance.

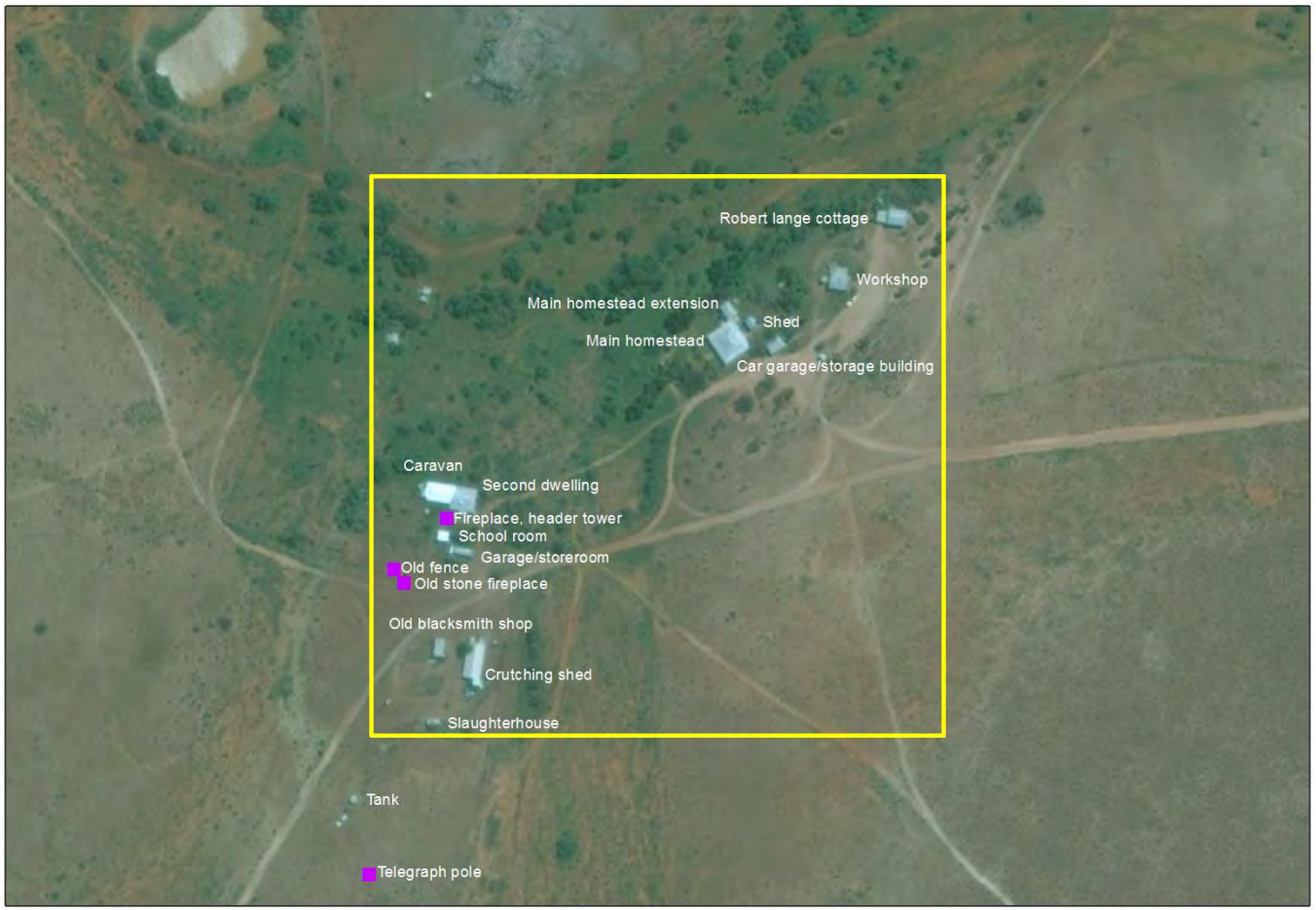

Figure 4.2 : Historical Heritage Features at Roopena Homestead

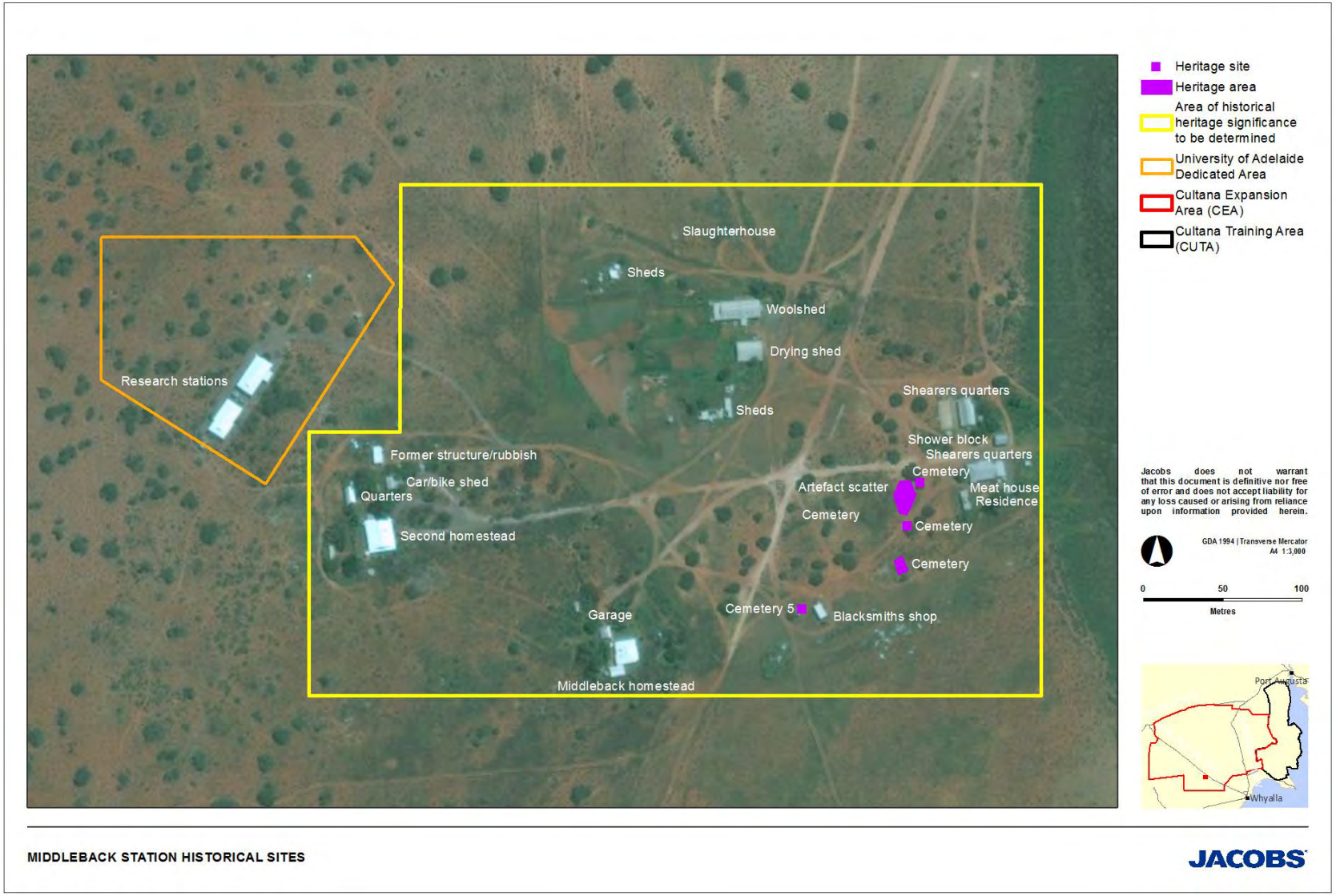

Figure 4.3 : Historical Heritage Features at Middleback Homestead

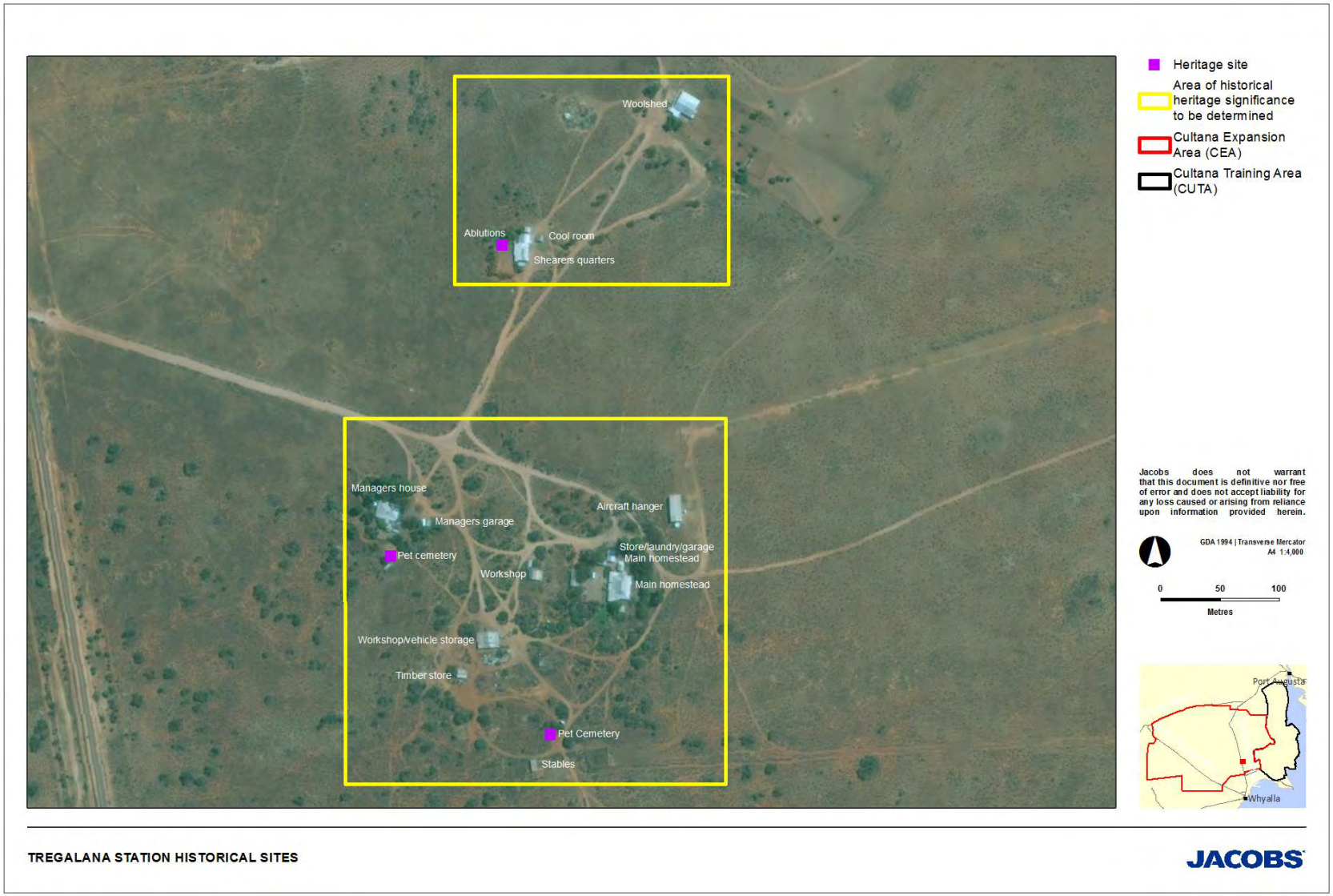

Figure 4.4 : Historical Heritage Features at Tregalana Homestead

Figure 4.5 : Historical Heritage Features at the Former Whyalla Gliding Club

5. Environmentally sensitive features

According to Condition 11 c) of the *EPBC Act* Approval for the CEA, environmentally sensitive features have been identified as including clay pans, contaminated sites, and highly erodible or saline soils. Comprehensive ground-truthed mapping of these features is required in order to fulfil Condition 11 c). The following sections outline the results of ground-truthed mapping of clay pans, contaminated sites, and highly erodible or saline soils across the CEA.

5.1 Clay pans

A total of 11 clay pans were identified across the CEA based on desktop and ground-truthed survey works. The location and approximate extent of the clay pans is provided on Figure 5-1. Photographic plates of the clay pans inspected as part of the ground-truthing surveys for this study are included as Appendix D. It should be noted that a number of the clay pans identified on Figure 5-1 had been identified through previous surveys undertaken across the site, including the PER (refer AECOM, 2012a) and a series of Cultural Heritage Clearance Surveys (refer AECOM 2012a).

A number of the clay pans identified also correspond with areas of cultural heritage significance (refer Section 4 and Jacobs 2015a).

5.2 Highly erodible or saline soils

Erodible soils by their nature are more susceptible to erosive processes including those as a result of natural processes (e.g. wind, water), and enhanced by anthropogenic processes (e.g. vehicle / foot traffic, reduction of vegetative cover, diversion of drainage systems, infrastructure development). The PER (AECOM 2012a) provided some preliminary discussion regarding the potential presence of erodible soils across the CEA, and the areas of the CEA where a higher erosion risk is present. AECOM (2012a) indicated that the south-western portion of the CEA, particularly to the south of Iron Knob Road, is an area that is likely to be more susceptible to erosion. This area has a concentration of ephemeral creek lines.

Further assessment of the potential presence of highly erodible soils was undertaken by Jacobs to inform this study. The assessment comprised a preliminary desktop assessment of available soil data, and incorporated remote sensing techniques to identify bare earth regions (i.e. areas devoid of vegetation) that may be more susceptible to erosion. A field survey was subsequently carried out to ground-truth areas more susceptible to erosion identified from the desktop studies. The ground-truthing results were then used to refine the remote sensing results for areas not visited on-ground. Figure 5-1 presents the areas of highly erodible soil identified through ground-truthing excercises, as well as those areas that are more likely to be susceptible to erosion. Photographic plates of highly erodible soils are presented in Appendix D. The areas identified may require direct management to maintain landscape structure and integrity should these areas be proposed for use and development.

The presence of ephemeral creeks with alluvial soil beds (e.g. sand, refer Plate 5-1) across the CEA have also been identified as areas more susceptible to erosion, with some containing highly erodible soil. The location of ephemeral creeks and water courses are also presented on Figure 5-1.

Jacobs observed minor existing erosion across the CEA, most commonly associated with tracks that traverse ephemeral creeklines or low lying areas (e.g. flood plains), and on or adjacent man-made earthen bunds (e.g. dam walls). Plate 5-2 presents an example of typical erosion observed across the CEA. The nature and location of existing erosion is sporadic and not easily mapped. However, given the majority of the CEA is very flat, existing erosion is not expected to be extensive and is considered likely to be largely isolated to those areas identified above and presented on Figure 5-1.

Dryland salinity, while commonly found in association with agricultural areas across Australia, was not found in the CEA. The only area of the CEA identified to contain saline soils was in the area of a small, unnamed salt lake near the northern boundary (approximately 4 km southeast of the off-site Pandurra Homestead). It should be noted that whilst this area had been identified in the PER (AECOM, 2012a) as the only permanent water

feature present in the CEA, it was dry at the time of inspection (February 2015). The extent of the unnamed salt lake is shown on Figure 5-1 with photographs taken of the salt lake presented in Appendix D. A second area identified through the remote sensing used for this study has been classified as an area of potential saline soil. The area is to the southeast of the unnamed salt lake (refer Figure 5-1).

Plate 5-1 Ephemeral creek bed with highly erodible alluvial sand deposits

Plate 5-2 Example of typical erosion observed across isolated areas of the CEA

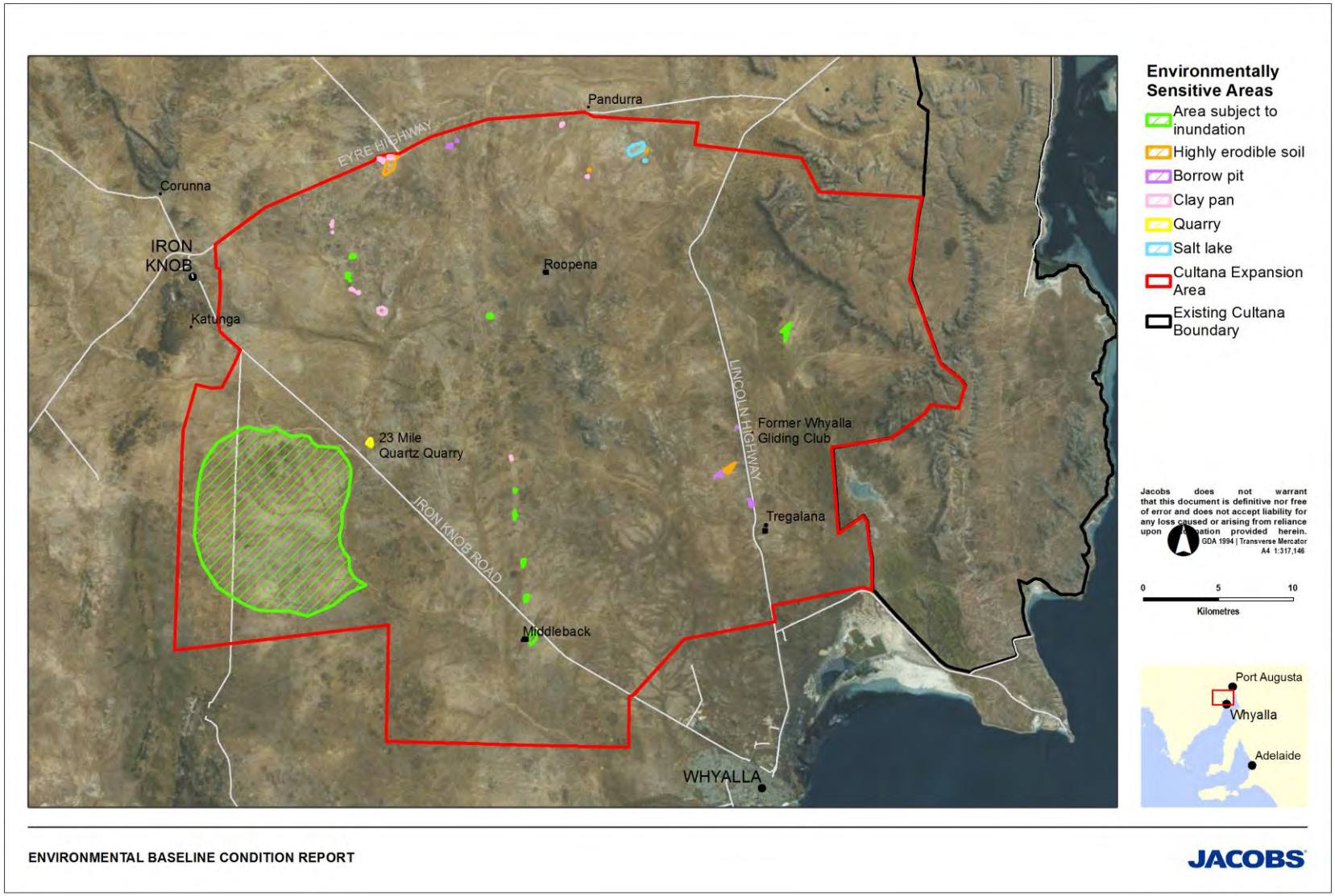

Figure 5-1 Environmentally sensitive features

5.3 Contaminated sites

A preliminary assessment of the presence and location of potential land contamination issues across the CEA was undertaken by Jacobs to inform this EBCR. The assessment included ground-truthing (visual inspection only) of potentially contaminating activities (PCAs) identified through previous studies / reports relating to the CEA, as well as observations made by the Jacobs contaminated land consultants who undertook the ground-truthing surveys. It was beyond the scope of the assessment to undertake a full Preliminary Site Investigation (PSI) in accordance with the National Environment Protection (Assessment of Site Contamination) Measure ((ASC NEPM) NEPC 1999).

Consistent with commentary in the PER (AECOM, 2012a), field observations made in respect of potential and / or existing land contamination issues indicated that the occurrences (or potential occurrences) are largely localised to homesteads and surrounding outbuildings and infrastructure, and the former Whyalla Gliding Club. The locations of the homestead areas and potential land contamination issues are presented on Figure 5.2 (Roopena), Figure 5.3 (Middleback), Figure 5.4 (Tregalana), and Figure 5.5 (Former Whyalla Gliding Club). A summary of the PCAs observed across the CEA, and the associated potential contaminants of concern (CoC), is provided in Table 5-1. Photographic plates showing the observed PCAs, grouped for each homestead and the former Whyalla Gliding Club, are included as Appendix E. The extent of any soil contamination that maybe associated with the identified PCAs is not known, however is expected to be limited to the homestead areas (and the former Whyalla Gliding Club), those areas identified in Figure 5-1, and their immediate surrounds. Further assessment / remediation of potential site contamination may occur as part of rectification works to be conducted prior to Defence use of the CEA. Furthermore, it is not known whether groundwater contamination associated with the identified PCAs is present beneath the CEA. However, any potential groundwater contamination is expected to be of limited extent in the context of the CEA's overall footprint (occupying an area of 159,000 ha).

In addition to the PCAs identified in Table 5-1, the potential for the presence of asbestos containing materials (ACM) and ACM related land contamination around buildings (from asbestos fibre and / or ACM fragments generated from such things as vandalism, maintenance activities and / or general degradation) may occur at the homesteads and areas of supporting agricultural infrastructure (e.g. sheering sheds, crutching sheds).

The PER also identified the potential for land contamination to exist in the vicinity of old sheep yards where sheep dips may have been present, and around areas of historical chemical storage, mixing, and disposal sites. There was no evidence identified during the field surveys undertaken by Jacobs to suggest the presence of historical sheep dipping activities across the CEA. Given that the occurrence of parasites across the CEA that may affect sheep (e.g. ticks, mites) is understood to be very limited, the lack of any observation of sheep dip infrastructure is not considered unusual. Notwithstanding, the possibility of the sheep dipping activities having previously been undertaken at the site cannot be definitively discounted as a PCA at the site.

Evidence of the presence of domestic effluent capture and storage (i.e. septic tanks) was observed at the homesteads. There is the potential that these septic tanks may have leaked over time and contributed to microbiological contamination of surrounding soils and shallow groundwater. However, the likelihood of significant site contamination associated with domestic effluent capture and storage activities is considered to be low and is not expected to present a significant risk to Defence in respect of the use and development of the CEA for proposed Defence activities. Appropriate management measures should however be adopted if this infrastructure is proposed to be removed.

Table 5-1: Summary of observed potential land contamination issues

Location	Potentially contaminating activities (PCAs)[1]	Potential Contaminants of Concern (CoC)[1]	Comments
Roopena Homestead	Bulk fuel storage: • 1 x underground fuel storage tank (UST) • 1 x above ground fuel storage tank (AST) • 1 x oil / fuel storage shed with staining on concrete floor • Surface soil staining with hydrocarbon (HC) odour beneath a former diesel AST (no longer present) Motor vehicle repair or maintenance: • Two vehicle service pits identified in sheds / workshops near the main homestead Incineration (domestic): • There was evidence of historical burning of domestic waste having occurred near the homestead Chemical storage: • Chemicals typically used in agricultural scenarios (e.g. herbicides and pesticides) may have been historically stored in outbuildings in the vicinity of the homestead	• Total Petroleum hydrocarbons (TPH) • Monocyclic aromatic hydrocarbons (MAH) (e.g. benzene, toluene, ethylbenzene & xylenes (BTEX)) and naphthalene • Polycyclic aromatic hydrocarbons (PAHs) • Phenolics • Methyl tertiary-butyl ether (MTBE) and other oxygenates • Heavy metals (e.g. barium, cadmium, copper, lead, nickel, zinc) • Dioxins • Solvents (e.g. trichloroethene) • Resins • Organochlorine pesticides (OCPs), organophosphorus pesticides (OPPs) • Chlorinated herbicides	The observed PCAs were located in relatively close proximity to the main homestead

Location	Potentially contaminating activities (PCAs)[1]	Potential Contaminants of Concern (CoC)[1]	Comments
Middleback Homestead	Bulk fuel storage: • 1 x UST (partially above ground) • 2 x oil / fuel storage sheds with significant staining on concrete floors and notable HC odour Waste oil disposal: • An unlined waste oil seepage pit was observed adjacent to the fuel / oil storage shed Motor vehicle repair or maintenance: • A vehicle service pit was identified in open space adjacent to the UST and area of waste oil disposal Private waste dumping: • There was an area of private waste dumping observed approximately 500m southeast of the main homestead Blacksmithing activities: • A former blacksmith shed is present amongst the homestead outbuildings Incineration (domestic): • There was evidence of historical burning of domestic waste having occurred near the homestead Chemical storage • Chemicals typically used in agricultural scenarios (e.g. herbicides and pesticides) may have been historically stored in outbuildings in the vicinity of the homestead Disposal of animal carcasses: • There was a concrete and steel drum containing animal carcasses approximately 300 m northeast of the Original Homestead	• TPH • MAHs and naphthalene • PAHs • MTBE and other oxygenates • Heavy metals • Solvents • Resins • Nutrients (e.g. nitrogen, phosphorus) • Ammonia • Phenols • Mineral oils • Dioxins • ACMs (landfilling) • Pathogens / biologicals (landfilling, animal carcasses) • OCPs, OPPs • Chlorinated herbicides	The observed PCAs were located in relatively close proximity to the main homestead

Location	Potentially contaminating activities (PCAs)[1]	Potential Contaminants of Concern (CoC)[1]	Comments
Tregalana Homestead	Bulk fuel storage: • 1 x UST • 1 x oil / fuel storage shed with staining on concrete floor • Evidence of a former bowser adjacent to the UST and oil / fuel storage shed Motor vehicle repair or maintenance: • A vehicle service pit was identified in open space adjacent to the UST and oil / fuel storage shed Chemical storage • Chemicals typically used in agricultural scenarios (e.g. herbicides and pesticides) may have been historically stored in outbuildings in the vicinity of the homestead	• TPHs • MAHs and naphthalene • PAHs • MTBE and other oxygenates • Heavy metals • Solvents • Resins • OCPs, OPPs • Chlorinated herbicides	The observed PCAs were located in relatively close proximity to the main homestead
Whyalla Gliding Club	Fuel / chemical storage: • There were multiple 200L fuel / chemical storage drums observed with evidence of soil staining in the immediate vicinity of the drums	• Petroleum hydrocarbons • Monocyclic aromatic hydrocarbons (e.g. BTEX) and naphthalene • PAHs • MTBE and other oxygenates • Heavy metals • Solvents	

[1] Based on SA *Environment Protection Regulations 2009* and *Assessment and management of contaminated sites*, Contaminated sites guidelines (WA DER, 2014)

Figure 5.2 : Roopena Homestead potential land contamination issues

Figure 5.3 : Middleback Homestead potential land contamination issues

Figure 5.4 : Tregalana Homestead potential land contamination issues

Figure 5.5 : Former Whyalla Gliding Club potential land contamination issues

6. Waterbodies and Watercourses

6.1 Floodplains and Watercourses

Multiple ephemeral watercourses traverse the CEA, with no occurrence of natural permanent fresh water sources (see Figure 6-1). The PER study noted a number of areas with vegetation characteristic of draining lines. During storm events, these watercourses flow into low relief land and existing dams before evaporating or infiltrating the soil. Fauna regularly use these ephemeral water courses (Plate 6-1). A small, unnamed ephemeral salt lake is present within the northern boundary of the CEA, however it is too saline for human or stock consumption. Myall Creek, which roughly follows the Lincoln Highway from Whyalla to Port Augusta, and a number of smaller unnamed drainage lines have been connected to anthropogenic drainage channels to enhance water collection and storage for pastoral purposes. The Nationally Important Wetland (EPBC SA020) of the Upper Spencer Gulf is in close proximity to both the existing CUTA and the CEA (Figure 6-1). This wetland is dominated by intertidal and supratidal mud and sand flats, salt marsh, subtidal seagrass meadows, mangrove forests and tidal creeks (Morelli. 1995). This wetland site is an important stop over to 14 species of migrant shorebirds, and provides foraging and breeding habitat for other avian fauna including the EPBC listed Hooded Plover (*Thinornis rubricollis rubricollis,* Vulnerable).

Plate 6-1 Sleepy Lizard (*Tiliqua rugosa*) in a drainage culvert post rainfall event during the 2014 survey

6.2 Existing Pastoral Dams and Groundwater Bores

Dams and or groundwater bore fed tanks and troughs are found in most paddocks (Figure 6-1), with a decline in land condition still evident in close proximity to these watering points (i.e. a higher concentration of stock tracks, larger areas of compacted soil, degraded / altered vegetation structure, greater prevalence of weeds). Minor erosion issues are present, most commonly associated with tracks that traverse ephemeral creeklines or low lying areas (e.g. flood plains), and on or adjacent man-made earthen bunds (e.g. dam walls). These groundwater bores have traditionally been used for supplementing fresh water sources for stock watering. However, the groundwater resource within the CEA is considered to be of limited beneficial use due to the high salinity levels and low productivity of the local aquifer. The groundwater depth across the CEA varies from a shallow (< 2 m below ground level) on the western flanks to over 20 m below ground level nearer the central

and south western regions of the CEA. The highest groundwater yields within the CEA generally align with areas of high salinity (14,000 mg/L), with the highest groundwater salinity across the CEA reaching 35,000 mg/L (AECOM 2012a).

Field assessments undertaken across the site by the South Australian Government (PIRSA, 2007) have shown that soil salinity generally falls within the 'non-saline' category, suggesting that dryland salinity is not occurring across the majority of the area and that vegetation present is generally well adapted to saline conditions.

Waterfowl and waders have been observed utilising the dams (DEWNR 2014; AECOM 2012a), however these anthropogenic water sources are not considered critical habitat to their survival. Defence typically decommission these dams on newly acquired properties to minimise impacts by feral goats, sheep and large native herbivores who rely on these types of water resources, however rabbit colonisation of decommissioned dam walls has been observed on other sites (pers. comms David Hackett 17 Octover 2014).

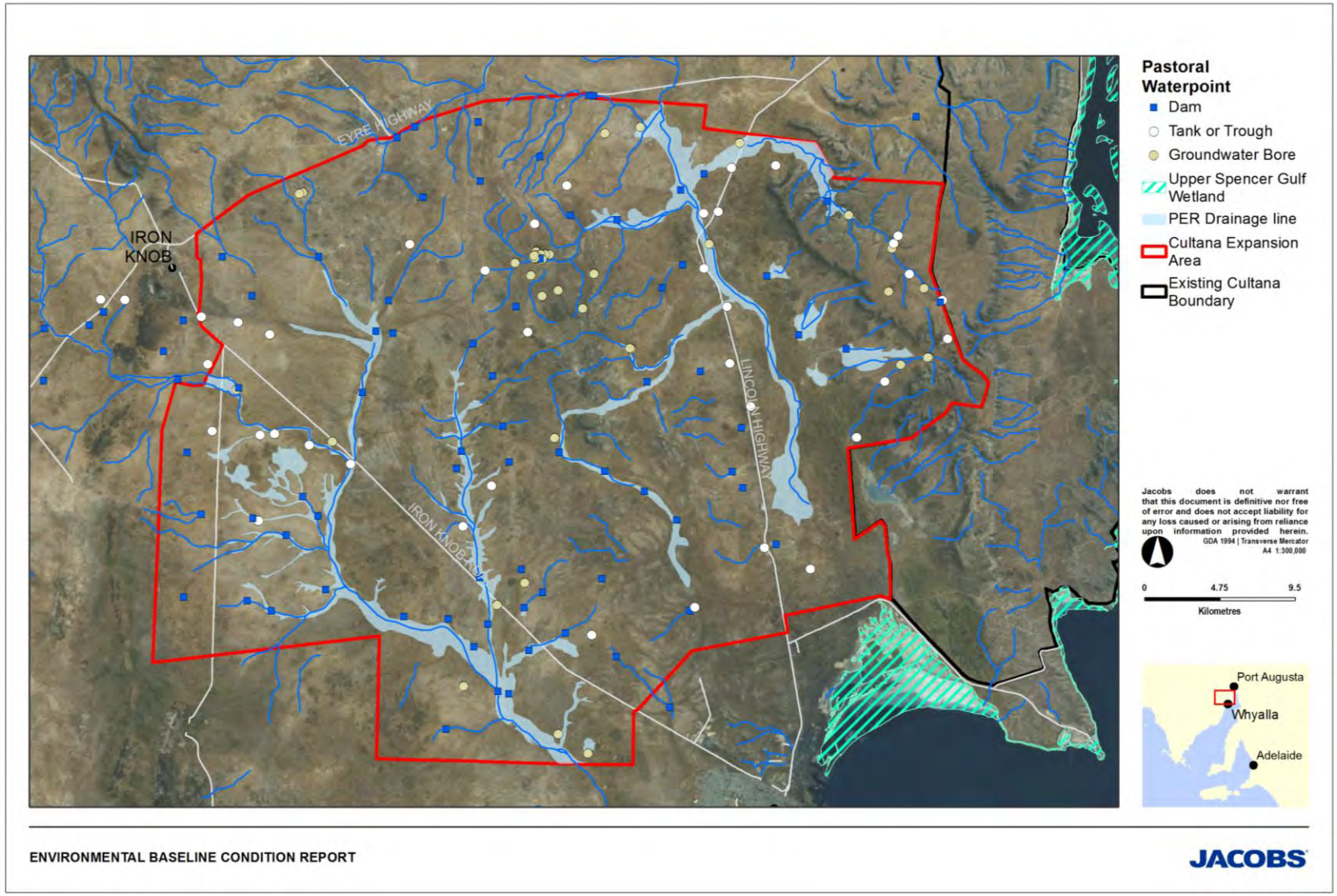

Figure 6-1 Watercourses and waterbodies of the CEA

7. Flora and Fauna

7.1 Desktop Summary

7.1.1 Gawler Bioregion Environmental Associations

The CEA is located in the Gawler Bioregion, a recognised transition zone between semi-arid / arid zones found north and west of the site, and more temperate regions closer to the gulf and southwards. The result is a naturally high diversity of habitat types and species, and many species which are at the limits of their expected ranges (AECOM 2012a), tempered by historical land management which has introduced various weeds and pests applying a range of environmental pressures. Five distinct IBRA regional native vegetation associations are described across the CEA; Buckleboo, Whyalla, Red Rock, Yudnapinna, Tregolana and Simmens (Laut. et al 1977). All of these associations have very high remnancy (95% or higher) all of which are very poorly conserved in the form of reserves, parks or vegetation Heritage Agreement areas. Buckleboo, the association with the highest remnancy (99%), has just 12% formally protected (DEWNR 2013a).

7.1.2 General flora and fauna

Open, sparse vegetation representative of semi-arid regions dominates the CEA. .The variety of habitat types that are present at the site include salt lakes, plains of low open chenopod shrubland dominated by saltbush and bluebush, Acacia shrublands, mallee and remnant stands of Callitris (native pine) and Casuarina (sheoak) woodlands as well as some restricted areas of Spinifex (*Triodia* spp.) associated with Mt Whyalla, and mallee along the eastern boundary. There are previous BDBSA records for a total 170 bird species (including 4 exotic), 20 mammals (6 feral) and 50 reptiles for the Cultana Expansion Area and 5 km buffer, for a complete list see Appendix F. There are previous BDBSA records for 475 flora species (99 of which are non-indigenous), for a complete list see Appendix F.

The most recent flora survey of the CEA was conducted in 2011 (AECOM 2012a). This survey identified a total of 363 taxa, 322 of which were native and 41 weed species. A total of 31 floristic communities were mapped across the study area. A full list of these floristic vegetation communities can be found in Appendix G.

Refer Section 8.1.1 for an assessment of weeds, and Section 8.1.2 for an assessment of pest fauna.

7.1.3 Threatened flora and vegetation communities

The EPBC Protected Matters Search Tool (PMST) revealed four threatened plants and one Threatened Ecological Community with the potential to occur in the area (see Appendix H). Two plants were identified as 'likely' to occur in the search area, and one of these species has previously been recorded in the area by the BDBSA; the Corunna Daisy (*Brachyscome muelleri;* Endangered, EPBC and NPW) and *Frankenia plicata*; (Endangered, EPBC , Vulnerable, NPW) which has no BDBSA records within 50 km of the CEA. Two other species and their habitat were identified as 'may occur within the area'; the Greencomb Spider Orchid (*Caladenia tensa*; Endangered, EPBC) and the Ooldea Guinea-flower (*Hibbertia crispula*; Vulnerable, EPBC and NPW). Of these two species, the closest record of the Greencomb Spider Orchid to the CEA is 38 km and there are no records of the Ooldea Guinea-flower within 50 km of the CEA. The PER (AECOM 2012a) confirmed the presence of only one flora species of conservation significance, however rates a number of other species as 'Likely' and 'Possible' to occur. See Table 7-1 for further details.

Further discussion of actual 'likelihood' for all of the potential EPBC listed species is provided in Appendix J in relation to previous records at the site (BDBSA), field results, knowledge of the species distribution.

The Threatened Ecological Community (TEC); Subtropical and Temperate Coastal Saltmarsh, is listed as Vulnerable under the EPBC Act. This TEC occurs on the coastline in South Australia in areas under regular or intermittent tidal influence, and is characterised by salt-tolerant vegetation including Austral seablite (*Suaeda australia)* and beaded glasswort (*Sarcocornia quinqueflora*) in the lower zone, common sea-heath *(Frankenia pauciflora)* and Samphire (*Teticornia* sp.) in the mid zone, and a diverse range of species in the higher, brackish zone (SPRAT 2014).

Table 7-1 Conservation flora and vegetation communities potentially present (EPBC PM Search Tool and BDBSA Data to 5km radius) within the study area

Species Name	Common Name	EPBC Act[1]	SA NPW Act[2]	EPBC Likelihood of Occurrence	Most Recent BDBSA Record	PER observed
Brachyscome muelleri	Corunna Daisy	EN	EN	Species or species habitat likely to occur within area	Yes 22/08/1983	Possible
Caladenia tensa	Greencomb Spider-orchid, Rigid Spider-orchid	EN	-	Species or species habitat may occur within the area	No	Unlikely
Frankenia plicata		EN	VU	Species or species habitat likely to occur within area	No	Not recorded in document
Hibbertia crispula	Ooldea Guinea-flower	VU	V	Species or species habitat may occur within area	No	Not recorded in document
Santalum spicatum	Sandalwood		V	Not listed	Yes 10/09/2010	Confirmed
Centrolepis cephaloformis ssp. cephaloformis	Cushion Centrolepis		R	Not listed	Yes 8/09/1974	Likely
Crassula exserta	Large-fruit Crassula		R	Not listed	Yes 8/09/1974	Highly likely
Rumex dumosus	Wiry Dock		R	Not listed	Yes 7/11/1936	Possible
	Subtropical and Temperate Coastal Saltmarsh	VU		Community likely to occur within area	No	Not EPBC listed at time of study

[1]Environment Protection and Biodiversity Conservation Act1999 Status: Endangered (EN), Vulnerable (VU)

[2]South Australian National Parks and Wildlife Act 1972 (NPWA) Status: Endangered (E), Rare (R), Vulnerable (V)

7.1.4 Threatened fauna

A total of 41 fauna species of national conservation significance were identified as potentially present within the survey area by the desktop review (BDBSA result and PMST results), all of which are birds. Only one of these 41 species, Western (Thick-billed Gawler Ranges) Grasswren (*Amytornis textilis myall),* has previous BDBSA records within the CEA. The conservation status of these species is provided in Appendix I.

It should be noted that BDBSA results included the Slender-billed Thornbill (*Acanthiza iredalei iredalei*). This species no longer has an EPBC listing, but still has a State rating of Rare. It should also be noted that in the 04/11/14 PMST there was no record of the Western (Thick-billed Gawler Ranges) Grasswren (*Amytornis textilis myall*) which was re-listed under the EPBC Act as Vulnerable on the 6th of November 2014. There were recent BDBSA records for both of these species within the CEA area.

Further discussion of actual 'likelihood' for all of the potential EPBC listed species is provided in Appendix J in relation to previous records at the site (BDBSA), field results, knowledge of the species distribution and habitat preferences and current habitat condition.

Twenty-seven species of fauna (all birds) listed under Commonwealth (EPBC) and or South Australian conservation legislation have been recorded by the BDBSA as previously present within the study area. Further details are provided in Appendix F. Species ranged from Raptors, Parrots, Waterbirds and smaller species and included the Western (Thick-billed Gawler Ranges) Grasswren, Slender-billed Thornbill, Australian Bustard, and the Major Mitchell's Cockatoo. Of the 27 species, only the Western (Thick Billed Gawler Ranges) Grasswren has EPBC status, and was last sighted during the PER fieldwork in 2009 (AECOM 2012a; DEWNR 2014a). In addition, the conservation status of some of the state listed species relate to subspecies that do not occur within the study area and BDBSA records do not indicate which subspecies were present (e.g. Jacky Winter, Bluebonnet and Hooded Robin), but it is likely they were the common species.

The conservation significance and current / future likelihood of occurrence for all of these species is discussed further in Section 10.2 and Appendix J.

7.2 Field Survey Summary

7.2.1 Weather conditions

The weather conditions of the survey were considered typical for November. Conditions were warm to hot, with maximum daily temperatures ranging between 22.5°C and 38.0°C, and minimum overnight temperatures ranging between 10.6°C and 21.1°C (BOM 2014, Whyalla station 018120). Mild weather was experienced at the beginning of the survey, with warmer weather, occurring towards the end of the survey period.

The overall conditions were considered suitable for fauna survey and not inhibitive of success. The variation in weather presented a wide range of temperature, air movement, moisture and sun exposure conditions, suggesting an opportunity for each of the target groups to be active and effectively detected by the survey. Overnight temperatures were warm, appropriate for mammal activity and nocturnal reptiles. Daytime conditions were suitable for general reptiles, and the mostly still, clear mornings were ideal for bird activity. The weather conditions during the survey are summarised in Table 7-2. It should be noted that the site is located further north inland of the Whyalla weather station, hence conditions were slightly warmer in reality.

Table 7-2 Field survey weather: Whyalla

Observation	17 Nov 14	18 Nov 14	19 Nov 14	20 Nov 14	21 Nov 14	22 Nov 14	Average
Maximum temperate °C	22.5	24.6	38.0	29.4	32.0	32.9	29.9
Minimum temperate °C	13.3	15.5	10.6	21.4	14.1	17.0	15.3
Rainfall (mm)	0	0	0	0.4	6.6	0	1.2
3pm relative humidity (%)	45	55	47	45	32	44	41
3pm wind speed (km/h)	24	17	20	28	22	37	26
3pm wind direction	S	SSE	NNW	NNW	E	S	

Source: BOM 2014, Whyalla Station 018120

7.2.2 Vegetation communities and condition

Vegetation communities observed within the study area are consistent with the floristic diversity of historical agricultural land in the eastern Eyre Peninsula. Degraded Chenopod communities dominate throughout the study area, including Saltbush and Bluebush open Chenopod shrublands. In addition, Myall (*Acacia papyrocarpa)* and patches of Mallee (Eucalyptus sp.) and Black Oak (*Casuarina pauper*) occur throughout the CEA.

Six broad vegetation communities were identified during the survey, namely:

- Red Mallee (*Eucalyptus oleosa*) / Yorrell (*E. gracilis*) open mallee over Chenopod low open shrub understorey on calcareous sandy plains
- Black Oak (*Casuarina pauper*) open woodland over Chenopod low open shrubland on calcareous plains.
- Lignum (*Duma florulenta*) open shrubland swamp
- Blackbush (*Maireana pyramidata*) and Saltbush (*Atriplex vesicaria*) low open shrubland alluvial plain

- Western Myall (*Acacia papyrocarpa*) low open woodland over mixed Chenopod low open shrubland
- Boree (*Melaleuca pauperiflora*) / Bluebush (*Maireana sedifolia*) open shrubland over Spinifex (*Triodia scariosa*) hummock grassland stony plateau

Habitat classification results from both AECOM (2012a) and the 2014 EBCR field survey were standardised and simplified by matching floristic communities described by AECOM (2012a) to recognised Eyre Peninsula Vegetation Communities, and within each community, specific Bushland Community Types (Milne *et al.* 2008) (See Appendix G for full list of floristic communities matched with BCMM communities). This approach has also provided benchmarked indicators of diversity and condition against which to assess the described habitats.

Table 7-3 summarises the different bushland community types found across the CEA. The majority of the CEA habitat (97 %) is considered to belong to Eyre Peninsula (EP) community 9 – open mallee and low open woodlands with a chenopod shrub understorey and chenopod open shrublands (refer EBCR, Jacobs 2015b), described by Milne *et al.* (2008) as:

> "Occurs in the most arid parts of the region, generally where rainfall is less than 300 mm per annum, and often less than 250 mm. Chenopod shrubs of around 1 m tall are the dominant life form, commonly with bladder saltbush (*Atriplex vesicaria*) and bluebush (*Maireana sedifolia*) the most common dominant shrubs and black bluebush (*Maireana pyramidata*) of limited occurrence and scattered tall shrub species including sennas (*Senna* spp.) and broom emubush (*Eremophila scoparia*). Common overstorey dominants are western myall (*Acacia papyrocarpa*), false sandalwood (*Myoporum platycarpum*), red mallee (*Eucalyptus oleosa*) and yorrell (*E. gracilis*)."

Table 7-3 Bushland community types found in the CEA

BCMM bushland community type[1] or state vegetation type[2]	% cover CEA[3]
State vegetation community	
boree +/- yorrell mallee tall open shrubland	0.2
EP community 7	
EP 7.1 - woodlands and mallee with mid-dense sclerophyll shrub understorey	0.9
State vegetation community	
Boree over bluebush low open shrubland	0.4
EP community 8	
EP 8.1 - boree with emergent red mallee	0.2
EP community 9	
EP 9.1 - black oak open woodland and woodland with chenopod shrub understorey	5.5
EP 9.1 - red mallee +/- yorrell mallee with chenopod understorey	2.7
EP 9.1 - western myall +/- false sandalwood low open woodlands	41.8
EP 9.2 - bladder saltbush shrubland	11.4
EP 9.2 - bluebush shrubland	4.2
EP 9.2 - chenopod open shrublands	31.6
State vegetation community	
Lignum open shrubland swamp	<0.1

[1] Table represents an assimilation of broad habitat types recorded by AECOM (2012a) and Jacobs (2015b); BCMM is Bushland Condition Monitoring Manual (Milne et. Al 2008)
[2] The BCMM lacked sufficient definition for three bushland community types referenced by AECOM (2012a) and Jacobs (2015a). In this case, reference has been made to the equivalent vegetation community type as defined by the state vegetation layer, DEH 2008
[3] Average percent cover from AECOM (2012a)

Detailed descriptions of the vegetation communities at each of the six flora and fauna survey sites, as well as the two targeted flora survey sites, are provided below. Site photos are also presented in 7.2.3 and Appendix B, with full species lists of flora species present at each survey site presented in Appendix N. Details of floristic community types (AECOM 2012a) and their associated EP Community listings observed in the CEA can be found in Appendix G.

7.2.3 Vegetation community (survey site) descriptions

Flora and fauna site 1

Site 1 is located in a broad run-on depression (swamp) with hard setting clay soils that support Lignum (*Duma florulenta*) open shrubland with scattered emergent stands of Weeping Emubush (*Eremophila longifolia*). Other shrub species include Spiny Saltbush (*Rhagodia spinescens*), Desert Emubush (*Eremophila deserti*) and Tarbush (*Eremophila glabra*) with a moderately dense ground storey including Comb Windmill Grass (*Chloris pectinata*), Mulka (*Eragrostis dielsii*) and the prostrate daisy Wires and Wool (*Lemooria burkittii*). Exotic species are prevalent throughout the site including Ward's Weed (*Carrichtera annua*), Burr Medic (*Medicago minima*) and patches of Horehound (*Marrubium vulgare*) (Declared). This site can be classified by State Vegetation Community as Lignum open shrubland swamp.

No national or state threatened flora species or WoNs were recorded at this site.

Plate 7-1 Flora and Fauna Site 1: Lignum (*Duma florulenta*) low-open shrubland swamp

Flora and Fauna Site 2

Site 2 is located on a sandy calcareous plain with Black Oak (*Casuarina pauper*) open woodland over Chenopod low open shrubland. Other overstorey species include Western Myall (*Acacia papyrocarpa*), Bullock Bush (*Alectryon oleifolius*) and False Sandalwood (*Myoporum platycarpum*). Bladder Saltbush (*Atriplex vesicaria*), Blackbush (*Maireana pyramidata*), Pearl Bluebush (*Maireana sedifolia*) and Intricate Saltbush (*Rhagodia ulicina*) are co-dominant in the mid-storey with a sparse ground storey including Oblique-spined Bindyi (*Sclerolaena obliquicuspis*), Rough Speargrass (*Austrostipa scabra ssp scabra*) and Small-flower Wallaby-grass (*Rytidosperma setaceum*). Harlequin Mistletoe (*Lysiana exocarpi ssp exocarpi*) and Pale-leaf Mistletoe (*Amyema maidenii*) were also recorded. Exotic species such as Ward's Weed (*Carrichtera annua*), were common throughout the site with scattered patches of Indian Hedge Mustard (*Sisymbrium orientale*) under tree canopies. This site can be classified as BCMM type EP 9.1 of Black Oak open woodland and woodland with chenopod shrub understory.

No national or state threatened flora species, WoNs or Declared weeds were recorded at this site.

Plate 7-2 Flora and Fauna Site 2: Black Oak (*Casuarina pauper*) open woodland over Chenopod low-open shrubland

Flora and Fauna Site 3

Site 3 is located in a low dunefield with Red Mallee (*Eucalyptus oleosa)* / Yorrell (*Eucalyptus gracilis*) open tree mallee community. Other overstorey species include Bullock Bush (*Alectryon oleifolius*) / False Sandalwood (*Myoporum platycarpum*), Native Apricot (*Pittosporum angustifolium*) and Dryland Tea-tree (*Melaleuca lanceolata*). The groundstorey is dominated by Chenopod shrubs including Intricate Saltbush (*Rhagodia ulicina*), Ruby Saltbush (*Enchylaena tomentosa*), Bitter Saltbush (*Atriplex stipitata*) and Erect Mallee Bluebush (*Maireana pentatropis*). Other low shrub species include Mueller's Daisy Bush (*Olearia muelleri*), Australian Boxthorn (*Lycium australe*), Stiff Westringia (*Westringia rigida*) and Tangled Burr-daisy (*Calotis erinacea*). This site can be classified by BCMM as EP 9.1 Red Mallee +/- yorrell mallee with chenopod understory.

No national or state threatened flora species or exotic flora species (common, Declared or WoNs) were recorded at this site.

Plate 7-3 Flora and Fauna Site 3: Red Mallee (*Eucalyptus oleosa*) / Yorrell (*E. gracilis*) open tree mallee

Flora and Fauna Site 4

Site 4 is located in a Blackbush (*Maireana pyramidata*) / Pearl Bluebush (*Maireana sedifolia*) low open shrubland alluvial plain. Emergent overstorey species including Weeping Emubush (*Eremophila longifolia*) and Pin-bush Wattle (*Acacia burkitti*) are found in scattered stands together with mid-storey shrubs such as Tarbush (*Eremophila glabra*), Australian Boxthorn (*Lycium australe*) and Leafless Cherry (*Exocarpos aphyllus*). The introduced Ward's Weed (*Carrichtera annua*) dominates the ground storey with scattered Rough Speargrass (*Austrostipa scabra ssp scabra*) and Knotty-butt Paspalidium (*Setaria constricta*) also recorded. Declared weeds Salvation Jane (*Echium plantagineum*) and Three-corner Jack (*Emex australis*) were recorded at this site. This site can be classified by BCMM as EP 9.2 Chenopod open shrublands.

No national or state threatened flora species, WoNs were weeds were recorded at this site.

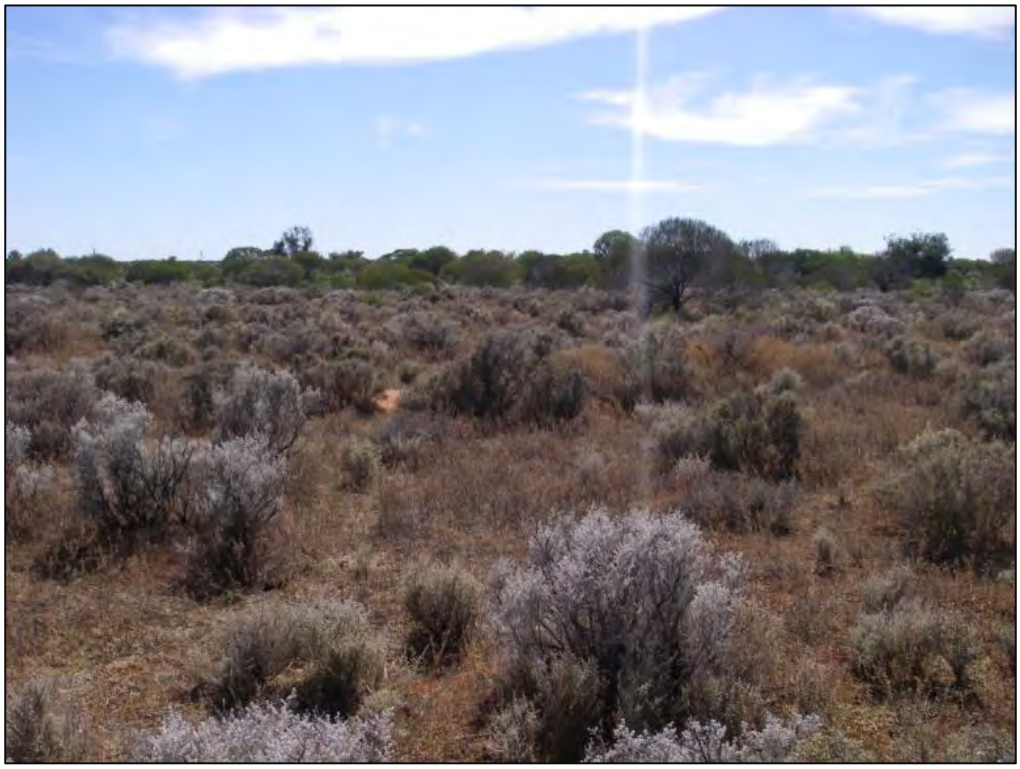

Plate 7-4 Flora and Fauna Site 4: Blackbush (*Maireana pyramidata*) / Pearl Bluebush (*Maireana sedifolia*) low open shrubland alluvial plain

Flora and Fauna Site 5

Site 5 is located in Western Myall (*Acacia papyrocarpa*) low open woodland over mixed Chenopod low-open shrubland community on calcareous sandy loam plain. Other overstorey species include False Sandalwood (*Myoporum platycarpum*), Bullock Bush (*Alectryon oleifolius*) and Native Apricot (*Pittosporum angustifolium*). Pearl Bluebush (*Maireana sedifolia*) dominates the low shrub layer with Bladder Saltbush (*Atriplex vesicaria*), Intricate Saltbush (*Rhagodia ulicina*) and Australian Boxthorn (*Lycium australe*) also common. Groundstorey species include Cannonball (*Dissocarpus paradoxa*), Obliquie-spined Bindyi (*Sclerolaena obliquicuspis*), Flat-awn Speargrass (*Austrostipa platychaeta*) and Dwarf Twin-leaf (*Zygophyllum ovatum*). Declared weed Horehound (*Marrubium vulgare*) were also recorded. This site can be listed by BCMM as EP 9.1 Western Myall +/- false sandalwood low open woodlands.

No national or state threatened flora species or WoNS were recorded at this site.

Plate 7-5 Flora and Fauna Site 5: Western Myall (*Acacia papyrocarpa)* low open woodland over mixed Chenopod low-open shrubland

Flora and Fauna Site 6

Site 6 is located in Bladder Saltbush (*Atriplex vesicaria*) / Blackbush (*Maireana pyramidata*) low open-shrubland alluvial plain. False Sandalwood (*Myoporum platycarpum*) is present as scattered emergents with Pearl Bluebush (*Maireana sedifolia*), Broom Emubush (*Eremophila scoparia*) and Australian Boxthorn (*Lycium australe*) present in the shrub layer. The sparse ground storey includes Small-flower Wallaby Grass (*Rytidosperma setaceum*), Pigmy Daisy (*Rhodanthe pygmaea*), Native Carrot (*Daucus glochidiatus*) and Oblique-spined Bindyi (*Sclerolaena obliquicuspis*). The introduced Ward's Weed (*Carrichtera annua*) is common throughout and scattered patches of Saffron Thistle (*Carthamus lanatus*) and Declared weed Horehound (*Marrubium vulgare*) were also recorded. This site can be listed by BCMM as EP 9.2 Bladder saltbush shrubland.

No national or state threatened flora or WoNs were recorded at this site.

Plate 7-6 Flora and Fauna Site 6: Bladder Saltbush (*Atriplex vesicaria*) / Blackbush (*Maireana pyramidata*) low open-shrubland alluvial plain

Flora Site A

Flora Site A is located on Simmons Lookout, a stony plateau that supports Boree (*Melaleuca pauperiflora*) / Pearl Bluebush (*Maireana sedifolia*) open shrubland over Spinifex (*Triodia scariosa*) hummock grassland. The shrubby overstorey is typically stunted with other species including Native Apricot (*Pittosporum angustifolium*), Sheep-bush (*Geijera linearifolia*) and Tarbush (*Eremophila glabra*) also present. Spinifex (*Triodia scariosa*) dominates the ground storey with other species including Rough Speargrass (*Austrostipa scabra spp. scabra)* and Rock Nightshade (*Solanum petrophilum*) also recorded. This site is listed as State Vegetation Community of Boree and bluebush low open shrubland over Triodia.

No national or state threatened flora species, WoNs or Declared weeds were present at this site.

Plate 7-7 Flora Site A: Boree (*Melaleuca pauperiflora*) / Pearl Bluebush (*Maireana sedifolia*) open shrubland over Spinifex (*Triodia scariosa*) hummock grassland

Flora Site C

Flora Site C is located in the south west corner of the study area in Red Mallee (*Eucalyptus oleosa*) / Yorrell (*Eucalyptus gracilis*) open tree mallee with a shrubby understorey including Bluebush Daisy (*Cratystylis conocephala*), Intricate Saltbush (*Chenopodium ulicinum*) and Pearl Bluebush (*Maireana sedifolia*). Other overstorey species include Sheep Bush (*Geijera linearifolia*) and Leafless Cherry (*Exocarpus aphyllus*). This site is dominated by old growth tree-mallee and it is estimated that this community has not been burnt for in excess of 50 years and is characterised by large tree hollows and thick litter levels. This site can be classified by BCMM as EP 9.1 Red Mallee +/- yorrell mallee with chenopod understory.

No exotic species were recorded at this site.

No national or state listed flora species were recorded at this site.

Plate 7-8 Flora Site C: Red Mallee (*Eucalyptus oleosa*) / Yorrell (*Eucalyptus gracilis*) open tree mallee

7.2.4 Species richness and floral diversity

A total of 115 plant species were recorded at the survey sites and opportunistically (Appendix K). Table 7-4 and Figure 7-1 below lists the species richness recorded at each site.

Table 7-4 CUTA flora sites – habitat types and flora species richness

Site	Broad Habitat Type	BCMM Veg Community	Flora Species Richness	
			native	exotic
Flora & Fauna 1	Lignum (*Duma florulenta*) open shrubland swamp	SA Vegetation Lignum open shrubland swamp	22	7
Flora & Fauna 2	Black Oak (*Casuarina pauper*) open woodland over Chenopod low open shrubland on calcareous sandy plain	EP 9.1	21	2
Flora & Fauna 3	Red Mallee (*Eucalyptus oleosa*)/Yorrell (*Eucalyptus gracilis*) open tree mallee	EP 9.1	37	0
Flora & Fauna 4	Blackbush (*Maireana pyramidata*/Pearl Bluebush (*Maireana sedifo*lia) low open shrubland alluvial plain	EP 9.2	29	9
Flora & Fauna 5	Western Myall (*Acacia papyrocarpa*) low open woodland over mixed Chenopod low open shrubland	EP 9.1	39	7
Flora & Fauna 6	Bladder Saltbush (*Atriplex vesicaria*)/Blackbush (*Maireana pyramidata*) low open shrubland alluvial plain	EP 9.2	25	3
Flora A	Boree (*Melaleuca pauperiflora*)/Bluebush (*Maireana sedifolia*) open shrubland over Spinifex (*Triodia scariosa*) hummock grassland stony plateau	SA Vegetation Boree and bluebush low open shrubland over Triodia	18	1
Flora C	Red Mallee (*Eucalyptus oleosa*) / Yorrell (*Eucalyptus gracilis*) open tree mallee	EP 9.1	22	0

A total of 104 native and 12 exotic plant species were recorded at sites and opportunistically during the 2014 survey of the EBCR. Refer Section 8.1.1 for a desktop assessment of weeds. Few broad leaf annual and short-lived perennial species were recorded which is indicative of the dry winter and spring that preceded the survey. The greatest native species richness was recorded in the Western Myall low open woodland community (Site 5) and the open mallee (Site 3) with 39 and 37 species respectively (see Figure 7-1 below).

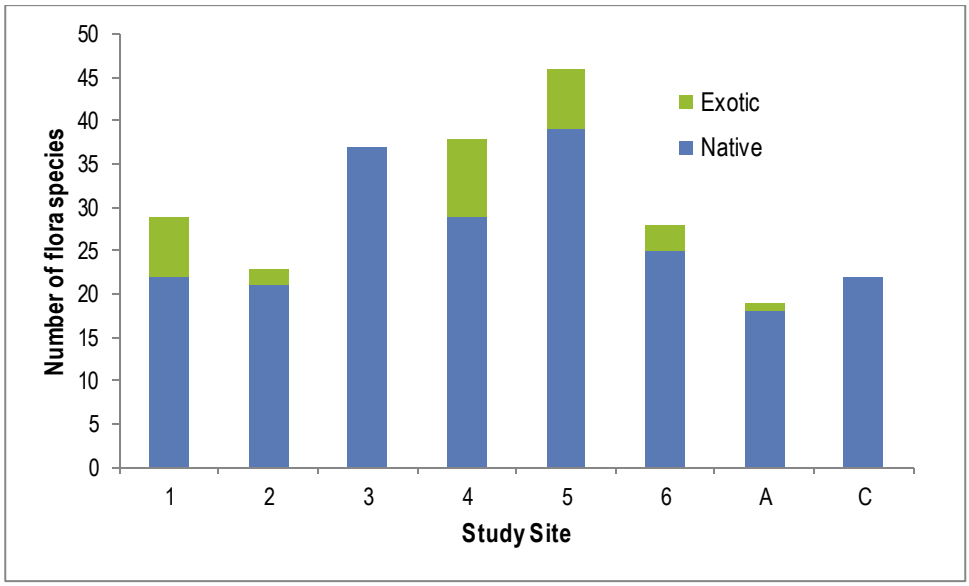

Figure 7-1 Species diversity of native and exotic flora species across study sites

7.2.4.1 Threatened flora species and ecological communities

No EPBC listed flora species were located during the flora survey. Only one state listed species was located within the CEA, Sandalwood (*Santalum spicatum)* opportunistically on the south-western corner of the CEA. These opportunistic sightings amounted to scattered plants throughout the CEA, particularly clustered in the south-western corner (see Figure 7-2 and Plate 7-9).

Plate 7-9 Sandalwood (*Santalum spicatum*) observed near Flora site C in the south-western corner of the CEA.

7.2.4.2 Condition assessment

Whilst methodologies to assess condition vary, most rely on an assessment of the type and level of disturbance and its impact at a given site together with a comparison of landscape and vegetation attributes with those of a similar or benchmark community. Livestock grazing has occurred throughout the CEA and not surprisingly, the condition of vegetation communities and landscapes largely reflects the impacts from this land use.

Livestock, like most herbivores, do not graze randomly; rather they are selective grazers, targeting food on the basis of palatability, digestibility and accessibility. Long-term impacts from preferential grazing typically include an increase in the cover and abundance of less palatable species with these impacts typically centred on livestock water points (Lange 1969). In addition, higher disturbance levels, particularly around of water points, provides an environment for short-lived species including declared and agricultural weeds.

Livestock have been removed from the CEA with most paddocks destocked for more than a year prior to the 2014 survey. Observations made at survey sites and during general reconnaissance reflect this reduced total grazing pressure with only light browsing of palatable species recorded. Re-shooting of palatable species including Bullock Bush, Pearl Bluebush and Western Myall together with seedling recruitment of palatable shrub species was recorded most survey sites indicating that native and feral herbivore populations were low in the months leading up to the survey (Plate 7-9). Extensive soil crusting and good litter levels were recorded at most survey sites and more generally in the study area which is also indicative of the low disturbance levels in recent times.

Plate 7-9 Fresh growth of palatable shrubs including Pearl Bluebush (above) – evidence of recent low herbivore pressure

The cessation of livestock grazing together with the decommissioning of watering points will result in a significant lowering of total grazing pressure throughout the CEA which over time, is likely to lead to changes to the structure and species composition of vegetation communities as well as soil surface and landscape function attributes. The rate and nature of these changes is dependent on a number of factors including seasonal conditions, however it is likely to include an increase in the tree and shrub cover in most vegetation communities (Booth *et al* 1996). Observations made during the 2014 indicate this process has begun and include widespread seedling recruitment of more palatable tree and shrub species including Western Myall, Pin-

bush Wattle, Quandong and Chenopods in addition to sucker growth of species including Black Oak and Bullock bush.

7.2.4.3 Biodiversity values

The biodiversity value of remnant vegetation within the CEA is dependent on a number of factors including the presence of habitat for wildlife, particularly listed flora and fauna, connectivity with other tracts of native vegetation and the intactness or condition of the community. The study area includes several communities that are considered to provide important habitat for wildlife and these are discussed below and presented spatially in Figure 7-2.

Old Growth Mallee

The study area includes significant areas of long-unburnt old growth mallee that provides important habitat for wildlife. Located in the south west corner and near the eastern boundary of the CEA, these communities are characterised by single trunk mallee > 3 m, often with hollows and a dense and structurally diverse litter layer (see Plate 7-10). These features, together with a diverse range of mid-storey shrub species, provide foraging and breeding habitat for a wide variety of bird, reptile and mammal species. It is estimated that the south western patch has not been burnt for more than 100 years and this area contains trees with large hollows that provide nesting habitat for threatened species including the state listed Major Mitchell Cockatoo. Another long-unburnt section of mallee in the south eastern corner is slightly younger (50-100 years) with good litter levels. Both of these sites may provide habitat for the nationally listed Malleefowl, with good litter levels and suitable foraging habitat adjacent the mallee.

Plate 7-10 Single stem trees with large hollows in old growth mallee in the south western corner of the CEA

Lignum Swamps

Localised lignum swamps found in the central and eastern parts of the study area provide important fresh water wetland habitat when inundated following major rainfall events. These areas hold water for several weeks and

provide foraging and breeding habitat for a variety of aquatic bird, amphibian and invertebrate species. In addition, during drier periods the dense shrub layer provides preferred habitat for several threatened bird species including the Thick-billed Grasswren (Western Gawler Ranges) (EPBC listed) and Slender-billed Thornbill (NPW listed). These small birds were recorded in this habitat during the 2014 survey. In addition, a number of common small bird species were utilising the clumps of Lignum, including the Variegated Fairy-wren, White-winged Fairy-wren, Redthroat and the Splendid Fairy-wren. Although the Splendid Fairy-wren does not have conservation significance, previous reports indicate it is culturally important to the Barngarla People.

Plate 7-11 Lignum swamps provide habitat for aquatic species following inundation and terrestrial species whilst dry

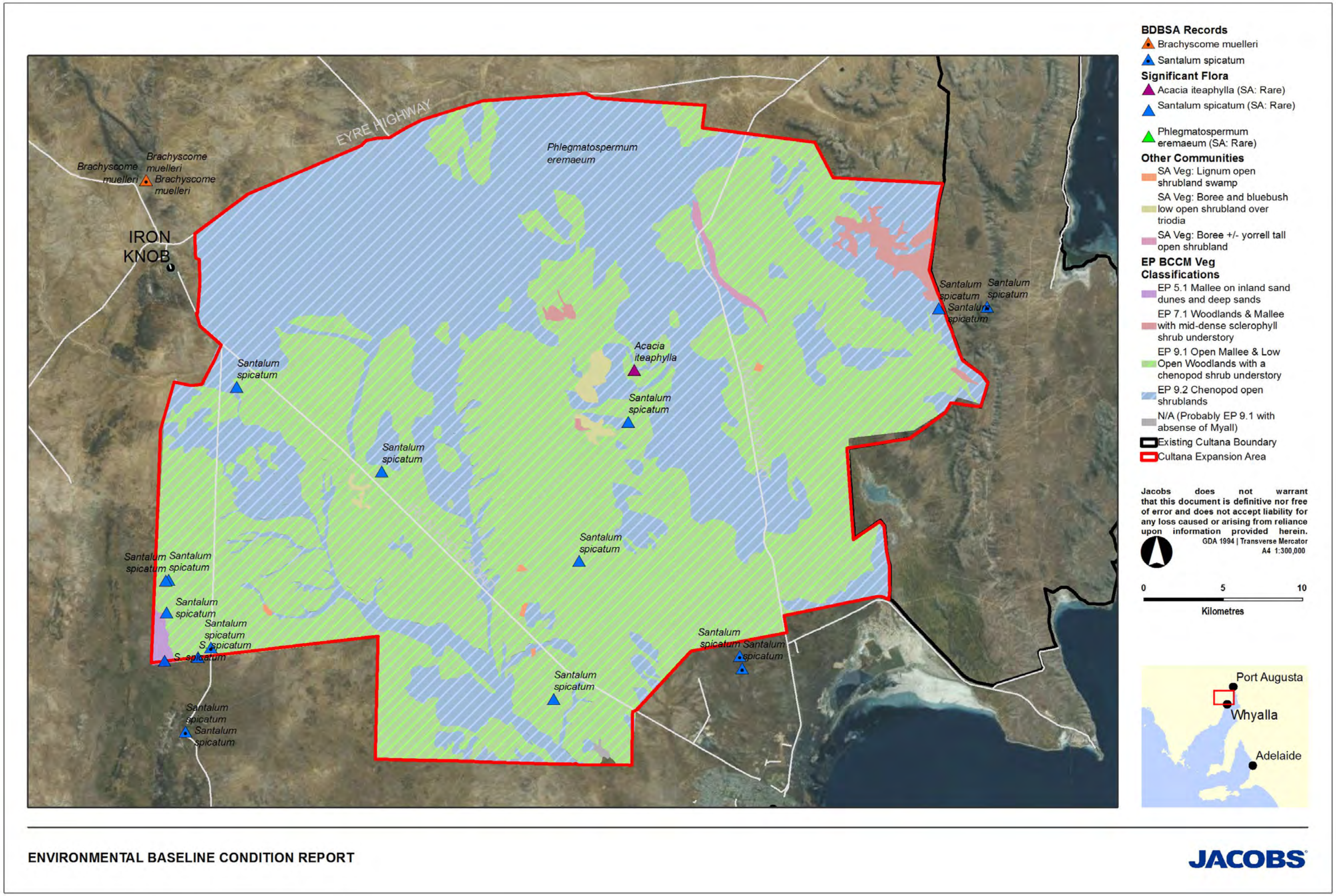

Figure 7-2 Environmentally sensitive areas of high biodiversity value and listed flora species

7.2.4.4 New flora records for CEA

A total of 116 plant species (104 native and 12 exotic) were recorded during the EBCR survey of the CEA (refer Appendix K). When flora survey results from the PER are included, a total of 396 flora species were observed on site. One hundred and sixty-four (177) flora species recorded during the survey have not been previously recorded by BDBSA, some of which are new records for the region. This number reflects the low level of previous studies that have occurred in the area. Some of the species identified in the PER are transient and or are not known to be present in the wider region, and may have been included in error.

7.2.5 Fauna survey results

A total of 62 bird species were observed during the recent survey, including one EPBC listed species and five NPW listed species, 16 mammals and 18 reptiles.

7.2.5.1 Fauna survey effort

Fauna survey method broadly followed the Vertebrate Survey guidelines (Owens 2000), along with site locations and survey plan agreed with the Department of Defence prior to undertaking the survey. The broadly accepted vertebrate survey guidelines recommend a minimum of four trapping nights to ensure sufficient trapping effort for the purposes of documenting key faunal assemblages across a study area. It was, however, noted that a study assessing survey effort by Read and Moseby (2001) suggests that within South Australian arid zones, the optimal number of traps nights to maximise the number of reptile species captured is five nights.

Table 7-5 summarises of total trapping effort across the survey. Survey effort has been calculated by number of trapping nights (number of traps multiplied by the number of nights the traps were set for) and the total number of active surveys and searches.

Table 7-5 Total Trapping Effort during 2014 CEA Survey

Site	Elliot box	Cage traps	Pitfall	Funnel	Anabat	Active Reptile, Track & Scat	Bird Surveys	Spotlighting/ Call Playback
1	80	8	12		2	2	4	1
2	80	8	20		1	2	4	1
3	80	8	20	8	2	2	4	1
4	80	8	24	8	1	2	4	1
5	80	8	20	8	1	2	5	1
6	80	8	20	8	1	2	5	1
Total	**480**	**48**	**116**	**32**	**8**	**12**	**26**	**6**

During this survey, pit fall and Elliot trapping proved to be the most successful means of trapping fauna, accounting for 59% of captures (66 of a total 112 captures). Of those Elliot traps however, 25 of the 27 captures were from House Mice. Only 9 captures were made in a funnel trap, and 2 captures were made in cage traps. Active searching was highly productive accounting for numerous reptile captures throughout the survey. The ANABAT recorders, while not physically capturing animals, recorded between 6-8 different bat species vocalisations that could be characterised across 6 sites. For several species there is overlap for the frequency of calls, hence the range for total number of bat species (D. Matthews, pers. comm.). Bat call ID was also

limited for site 2 as there were a large number of insects out that night and the standard sensitivity setting proved to be too high.

7.2.5.2 Fauna species richness and diversity

This fauna survey identified a total of 96 vertebrate species from the 6 survey sites and opportunistically within the study area. Of these 96 species, 14 species were not previously recorded by the BDBSA within a 5 km radius of the EL (3 birds, 4 reptiles and 7 mammals), but all of which are relatively common throughout the greater Eyre Peninsula, with the exception of one bat species, see Mammal section below. The vertebrate species identified in the study area are summarised below:

- 62 birds
- 18 reptiles
- 16 mammals

Only six of the 96 species of fauna (6.3%), all birds, hold conservation significance at a national or state level, however some for some of these species the specific race that occurs in the region does not actually hold conservation significance. This is discussed further in Section 10 – Matters of Conservation Significance.

The following sections provide detail on each faunal group identified including summary tables of species. Appendix L presents a comprehensive list of all fauna found within the CEA during the 2014 EBCR survey. Appendix M presents a comprehensive list of all fauna found within the CEA to date. Refer Section 8.1.2 for a desktop assessment of pest fauna.

Birds

A total of 62 native bird species were observed during the survey, with no introduced species observed. Site 3 had the greatest diversity of birds with 28 species recorded, while sites 2, 4, and 5 had 25, 27 and 27, respectively. Sites 1 and 6 had the lowest diversity with 14 and 15 species respectively. Opportunistic sightings were also recorded for 23 species (refer Appendix L, Figure 7-3, and Plate 7-13).

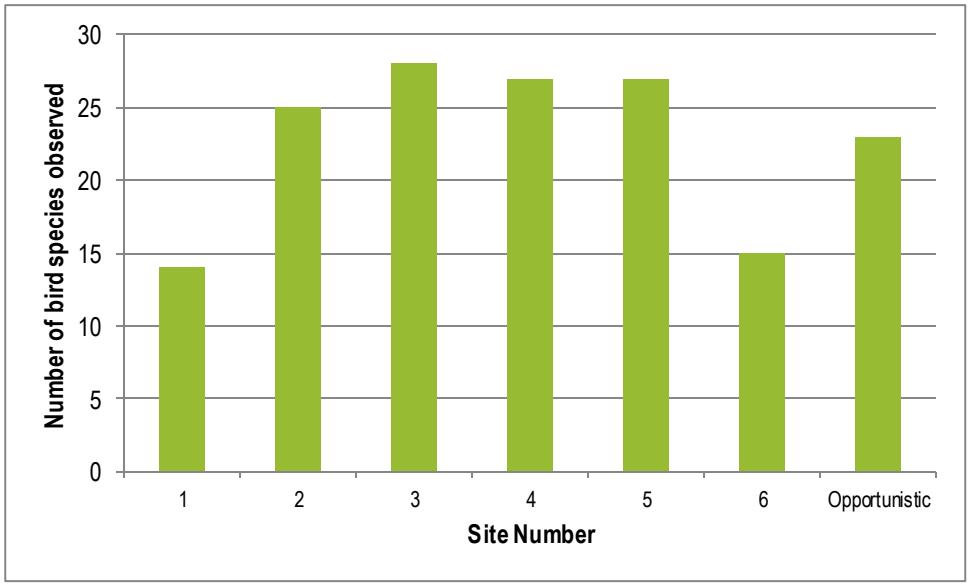

Figure 7-3 Bird Diversity across sites

Of the 62 bird species recorded during the survey, one has national (EPBC Act) conservation significance; Western Grasswren (Gawler Ranges subspecies, *Amytornis textilis myall*, Vulnerable). This species was observed primarily in low chenopod shrubland (see Figure 7-6). In addition, two species has a rating under

State legislation (NPW Act) were recorded, Gilbert's Whistler (*Pachycephala inornata*, Rare) and Slender-billed Thornbill (*Acanthiza iredalei iredalei*, Rare).

It should be noted that three species with *ssp* (subspecies) ratings under the NPW Act, were observed, however they were not the species with ratings, i.e. they were not Grey Currawong (north western subspecies, *Strepera versicolour plumbea*), Jacky Winter (south east subspecies, *Microeca fascinans fascinans*) or Bluebonnet (western subspecies, *Northiella haematogaster narethae*). The subspecies observed were the common subspecies including:

- Bluebonnet (*Northiella haematogaster haematogaster*) at Site 5
- Grey Currawong (*Strepera versicolor intermedia*) at Site 3
- Jacky Winter (*Microeca fascinans assimilis*) at Site 2, 3, 4 and 5

A complete bird list from the 2014 study area is provided in Appendix L.

The BDBSA search indicated an additional 111 species that were not recorded during the EBCR survey of the CEA. Of these 111 BDBSA species, none have national conservation significance, but 20 species have state conservation significance. These species are shown in Appendix I. The likelihood of these species occurring in the study area is discussed further below.

The likelihood of these species occurring in the study area is discussed further in Section 10 below.

Wedge-tailed Eagle nest with Juvenile near Site 1

Male Variegated Fairy-wren near Site 1

Plate 7-12 Birds observed opportunistically on the CEA

Reptiles

Eighteen (18) reptile species were recorded during the survey, including skinks, dragons, geckos, snakes and a Sand Goanna (refer Appendix L, Plate 7-13, Figure 7-4). The greatest diversity of reptiles was recorded at Site 2 and 5, with seven species. The next highest diversity was found at Sites 3, 4 and 6, with 4, 5 and 6 species respectively, while Site 1 had the least diversity with just 2 reptiles recorded. Six (6) records, however, came from opportunistic sightings and captures across the survey area and alongside access tracks near Middleback Station.

Four species recorded during this survey, had not been previously recorded within the BDBSA for the CEA, including the Broad-banded sand swimmer, Beaked Gecko, Saltbush Morethia Skink and the Bearded Dragon. All reptile species recorded were native and none hold any conservation significance under state or national legislation.

Overall, the reptile species richness observed during the survey was relatively low compared to what would be expected for both the chenopod, older Myall, Mallee and Sheoak woodlands communities. The various trapping methods employed were considered sufficient. Slightly hotter weather conditions may have contributed to lower records for reptile species.

Myall Slider (*Lerista edwardsae*)

Beaked Gecko (*Rhynchoedura ornata*)

Southern Spiny-tailed Gecko (*Strophurus intermedius)*

Broad-banded sand swimmer (*Eremiascincus richardsonii*)

Plate 7-13 Some reptiles captured in the CEA study area

Figure 7-4 Reptile diversity across sites on the CEA study area

Mammals

A total of 16 mammals were recorded in the study area. Of these 16 mammals, six were introduced and the remainder were native (refer Appendix L). None of the mammals are of conservation significance under state or national legislation. The highest mammal diversity was recorded at Site 6 and Site 3 with a total of eight and seven species respectively (see Figure 7-5). ANABAT calls could not be clearly distinguished for some species, because the calls for these species are very similar (D. Matthews pers. comm.), hence actual numbers could be slightly higher if both *Nyctophilus* species and both *Mormopterus* species and all *Vespadelus* species were present. Bat calls were confirmed by Dennis Matthews.

No mammals of conservation significance were recorded during the EBCR survey.

Plate 7-14 Little Long Tailed Dunnart (*Sminthopsis dolichura*)

Four mammals recorded in this survey have not been previously been recorded in the study area in the BDBSA; the Little Long-tailed Dunnart (*Sminthopsis dolichura* Plate 7-14), Bolam's Mouse (*Pseudomys bolami*), White-striped Freetail Bat (*Austronomus australis*) and Southern Forest Bat (*Vespadelus regulus*). Although there are no BDBSA records within the CEA for these species, the site occurs within the known distribution ranges for these species (Owens and Graham 2009, updated online 2014).

The BDBSA records also indicate a further five native and one feral species that were not recorded during the EBCR survey; Euro Kangaroo (*Macropus robustus*), Mitchell's Hopping-mouse (*Notomys mitchellii*), Fat-tailed Dunnart (*Sminthopsis crassicaudata*), Stripe-faced Dunnart (*Sminthopsis macroura*), Inland Broad-nosed Bat (*Scotorepens balstoni*) and feral Horses (*Equus caballus*).

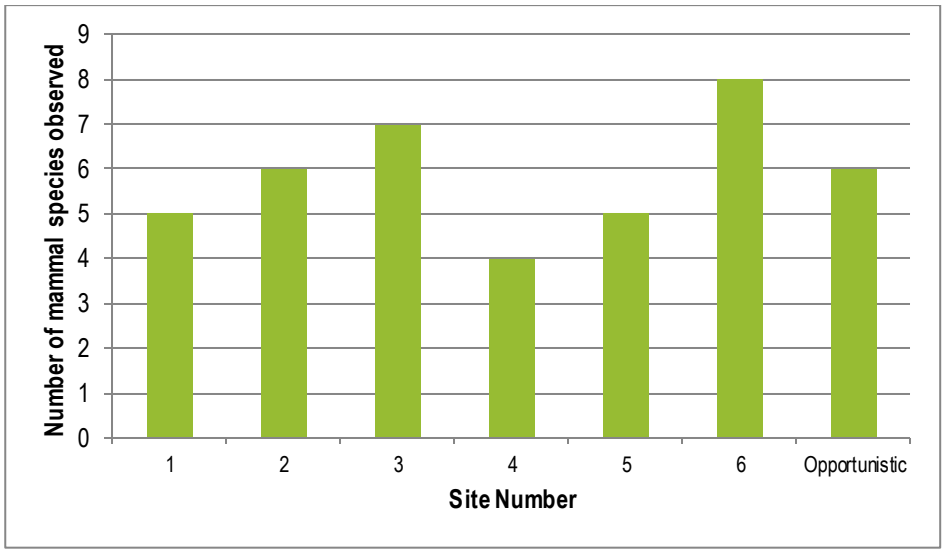

Figure 7-5 Mammal diversity across sites

Other natives

No amphibians were recorded during the EBCR survey with weather conditions and site conditions being unsuitable for frog sightings during this time.

There are BDBSA records for three frog species within the CEA; Spotted Marsh Frog (*Limnodynastes tasmaniensis*), Burrowing Frog (*Neobatrachus pictus*) and Sudell's Frog (*Neobatrachus sudelli*). Whilst they may occur during wetter periods, none of these amphibians hold conservation significance at a national or state level.

7.2.5.3 New records for CEA

A total of 17 new (not previously recorded by the BDBSA) fauna records were found for the CEA. These include five reptiles, four mammals and eight birds (see Table 7-6 New fauna records for the CEA). None of these species are protected under the EPBC Act.

Table 7-6 New fauna records for the CEA

Scientific Name	Common Name
Reptiles	
Eremiascincus richardsonii	Broad-banded sand swimmer
Morethia adelaidensis	Saltbush Morethia Skink
Pogona barbarta	Bearded Dragon
Rhynchoedura ornata	Beaked Gecko
Strophurus elderi	Jewelled Gecko
Mammals	
Austronomus australis	White-striped Freetail Bat
Pseudomys bolami	Bolam's mouse
Sminthopsis dolichura	Little long tailed Dunnart
Vespadelus regulus	Southern Forest Bat

Scientific Name	Common Name
Birds	
Myiagra inquieta	Restless Flycatcher
Psephotus haematonotus	Red-rumped parrot
Podargus strigoides	Tawny Frogmouth
Anas rhynchotis	Australasian Shoveler[1]
Himantopus himantopus	Black-winged Stilt[1]
Accipiter fasciatus	Brown Goshawk[1]
Megalurus gramineus	Little Grassbird[1]
Climacteris affinis	White-browed Treecreeper[1]

[1] Not recorded in the BDBSA or in 2014, but noted in the PER and occurs within know n distribution range (Simpsons and Day 2010)

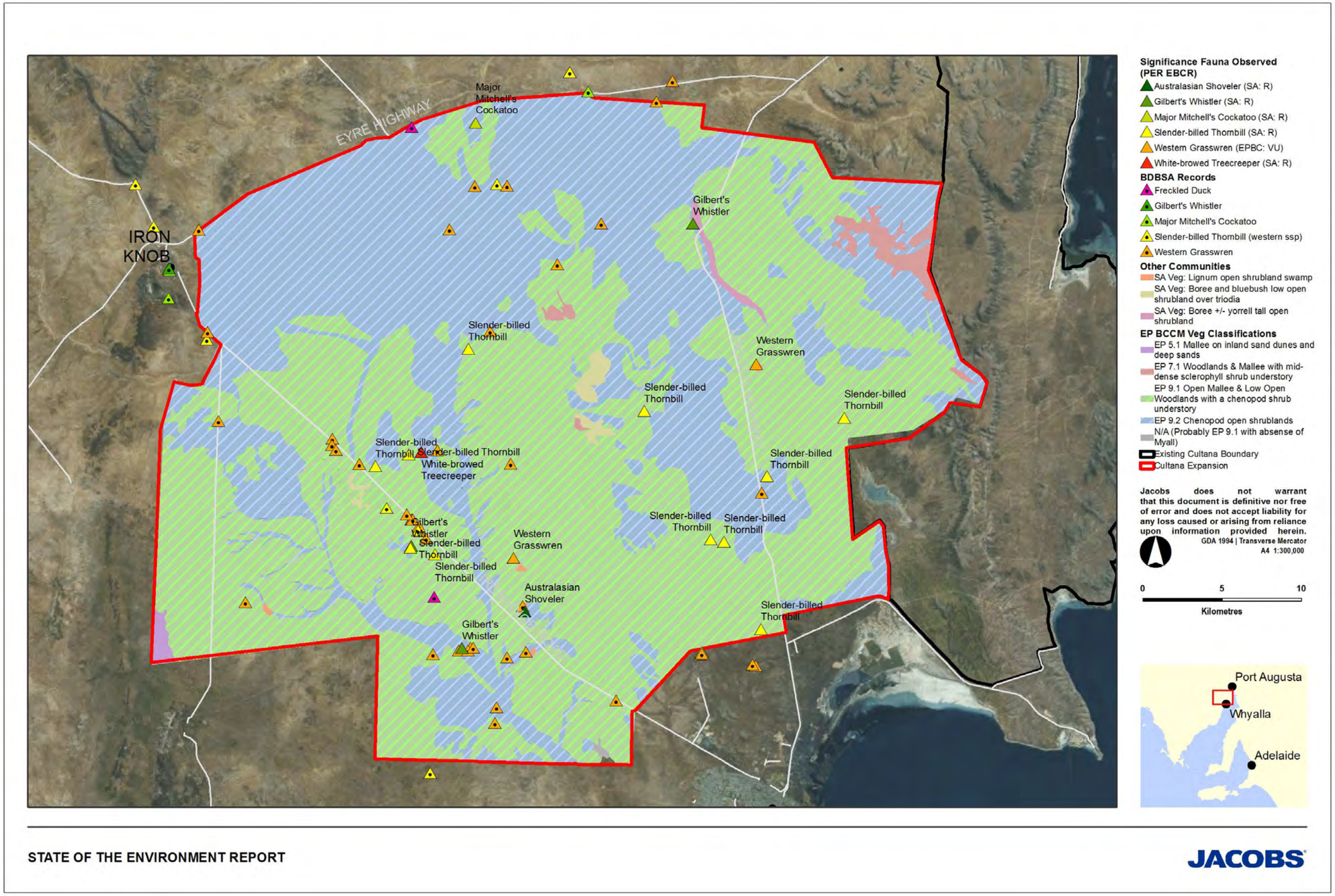

Figure 7-6 Environmentally sensitive areas of high biodiversity value and associated listed fauna species

7.2.6 Total Species Diversity

The overall diversity across the CEA during the 2014 EBCR field survey is considered to be typical of the habitat and conditions experienced, noting the dry preceding months and lack of ephemeral and annual plant species, and the lack of flowering plants (see Table 7-7 and Figure 7-7). In summary:

- Sites 1 and 6 displayed the lowest total diversity, with 51 and 57 species respectively.
- Sites 3 and 5 were the highest diversity sites with 77 and 85 species.
- Differences between sites are primarily related to the variation in bird sightings and level of plant diversity between sites.

Most bird groups were represented, although some such as waterbirds (only three species reported) could be considered poorly represented, perhaps indicating a lack of survey sites near water sources or the coast. The observed waterbirds were recorded opportunistically on an agricultural dam. While these dams number over 75 (PIRSA 2008), many are ephemeral and do not act as permanent water sources. Defence typically decommission such dams on newly acquired properties (David Hackett, pers. comm., 17 October 2014). There are no wetlands or other substantial sources of water on the CEA to provide habitat for waterbirds, therefore it is unlikely they will be observed on site or that the dams are critical to species survival.

Bat species richness was consistent with what would usually be expected for Mallee and chenopod shrubland habitat, with the notable presence of *Nyctophilus* (Long-eared Bats) and *Mormopterus* (Freetail Bats) families and *Austronomus australis* (White-striped Freetail Bat). In a related study, Lumsden and Bennett (1995) note that of the four different semi-arid habitat types in which trapping was conducted, Mallee Shrubland had the lowest mean number of species per successful trapping event. Despite this, Lumbsden and Bennett (1995) still recorded seven different taxa in similar habitats within the Victorian Mallee region, consistent with the number of species recorded here. The number of bats recorded during this study is reflective of the presence of good nesting habitat provided by old growth mallee stands, which supported numerous hollows, particularly as site 3 and site 5.

Mammal richness was low, but around what would be expected for this disturbed landscape (Menkhorst and Bennett 1990). However, the number of introduced species was high which could lead to lower numbers of native mammals. The BDBSA and previous studies in the area indicated the Fat-tailed Dunnart (*Sminthopsis crassicaudata*), Stripe-faced Dunnart (*Sminthopsis macroura*) and Hopping Mice have previously been recorded in the region. House mice were caught at all sites with the exception of Site 2, which is consistent with the historical landuse of the CEA.

Reptile species richness was moderate, with species captured across all 'functional groups'. Climatic conditions during the survey were conducive to high reptile activity and expected capture rates, being relatively sunny, warm and fine. Of note, Shingleback lizards were observed in high numbers following a rainfall event.

Table 7-7 Species Diversity by Site

Site	Broad Habitat Type	Plants	Birds	Reptiles	Mammals	Total (Inc. Plants)
1	Lignum open shrubland swamp	30	14	2	5	52
2	Black Oak open woodland over Chenopod low open shrubland on calcareous sandy plain	23	25	7	6	62
3	Red Mallee / Yorrell open tree mallee	38	28	4	7	78
4	Blackbush / Pearl Bluebush low open shrubland alluvial plain	38	27	5	4	74
5	Western Myall low open woodland over mixed Chenopod low open shrubland	46	27	7	5	87
6	Bladder Saltbush / Blackbush low open shrubland alluvial plain	28	15	6	8	58

Figure 7-7 Total species diversity across flora and fauna sites

8. Weeds and Pests

8.1 Desktop Investigation

8.1.1 Weeds

The EPBC Protected Matters Search Tool (PMST) and BDBSA data (see Appendix H and Appendix F respectively) indicated that nine significant weed species are likely to be present within the study area (Table 8-1). A search of BDBSA records within the CEA indicated the presence of 60 weeds that have recent records (i.e. within the last 20 years); including African Boxthorn (*Lycium ferocissimum*), Pricky Pear (*Cylindropuntia* sp. and *Opuntia* spp.) and Ward's Weed (*Carrichtera annua*). These species are known to exist in the greater Eyre Peninsula region (DEH 2001). African Boxthorn and Prickly Pear are Declared for the whole of South Australia under the *Natural Resources Management Act 2004* (i.e. if present they must be actively controlled) and are also recognised as Weeds of National Significance (WoNS) (AWC, 2012).

The PER field survey results indicate over 20 infestations of weed, of 9 species across the CEA area. The species recorded include Declared species of Three Corner Jack, Salvation Jane, African Boxthorn, Horehound and Bathurst Burr.

Table 8-1 Weeds flagged as potentially present (EPBC PMST and BDBSA) within the study area

Species Name	Common Name	EPBC Likelihood of Occurrence	Most recent BDBSA Record	Status[1]	Observed in PER Study?
Asparagus asparagoides	Bridal Creeper	Species of species habitat likely to occur within the area	Not listed	Declared and WoNS	No
Austrocylindropuntia spp.	Prickly Pears	Species of species habitat likely to occur within the area	18/09/1984	Declared and WoNS	No
Carrichtera annua	Ward's Weed	Species of species habitat likely to occur within the area	10/05/2004	No	Yes
Cylindropuntia spp.	Prickly Pears	Species of species habitat likely to occur within the area	17/07/2005	WoNS	No
Lycium ferocissimum	African Boxthorn	Species of species habitat likely to occur within the area	01/01/2010	Declared and WoNS	Yes
Opuntia spp.	Prickly Pears	Species of species habitat likely to occur within the area	18/11/2010	Declared and WoNS	No
Parkinsonia aculeata	Parkinsonia, Jelly Bean Tree	Species of species habitat likely to occur within the area	Not listed	Declared and WoNS	No
Solanum elaeagnifolium	Silver Nightshade	Species of species habitat likely to occur within the area	Not listed	Declared and WoNS	No
Tamarix aphylla	Athel Pine	Species of species habitat likely to occur within the area	Not listed	Declared and WoNS	No

[1] Declared status as per state *Natural Resources Management Act, 2004;* WoNS = Weed of National Significance (AWC, 2012)

8.1.2 Pest fauna

A total of 16 pest species, namely eight mammals and eight birds, were identified by the desktop review as potentially occurring in the study area (See Table 8-2).

An EPBC Protected Matters Search and BDBSA data suggest the potential presence of 15 pest species, all classified as 'likely' or with appropriate 'habitat that is likely to occur' within the CEA (see Appendix H). All 15 pest fauna are considered to pose a particularly significant threat to natural biodiversity in Australia; in terms of predation, competition for resources and habitat destruction. The presence of nine of these fauna was confirmed through BDBSA records within the study area all with recent records (i.e. within the last 30 years) as well as the presence of one other introduced species: Wild Brumby (*Equus caballus).*

Table 8-2 Pest fauna species previously recorded in CEA (EPBC PMST, BDBSA, PER)

Common Name	Species Name	Most recent BDBSA Records	EPBC PMST Suggestion	Observed in PER study?
Black Rat	*Rattus rattus*	No BDBSA records	Species or species habitat likely to occur within area	No
Common Blackbird	*Turdus merula*	No BDBSA records	Species or species habitat likely to occur within area	No
Common Starling	*Sturnus vulgaris*	30/08/2006	Species or species habitat likely to occur within area	No
Domestic (Feral) Cat	*Felis Catus*	11/09/2007	Species or species habitat likely to occur within area	No
Domestic Dog	*Canis lupus familiaris*	No BDBSA records	Species or species habitat likely to occur within area	No
Eurasian Skylark	*Alauda arvensis*	13/09/2007	Species or species habitat likely to occur within area	No
European Goldfinch	*Carduelis carduelis*	No BDBSA records	Species or species habitat likely to occur within area	No
Feral Goat	*Capra hircus*	01/01/2007	Species or species habitat likely to occur within area	Yes
Feral Pigeon (Rock Dove)	*Columba livia*	26/01/2000	Species or species habitat likely to occur within area	
Fox (Red Fox)	*Vulpes vulpes*	1/01/1991	Species or species habitat likely to occur within area	Yes
Horse (Brumby)	*Equus caballus*	1/01/2007	Not applicable	
House Mouse	*Mus musculus*	17/09/2007	Species or species habitat likely to occur within area	
House Sparrow	*Passer domesticus*	23/06/2000	Species or species habitat likely to occur within area	
Mallard	*Anas platyrhunchos*	No BDBSA records	Species or species habitat likely to occur within area	
Rabbit (European Rabbit)	*Oryctolagus cuniculus*	13/09/2007	Species or species habitat likely to occur within area	Yes
Spotted Turtle-dove	*Streptopelia chinensis*	No BDBSA records	Species or species habitat likely to occur within area	

8.2 Field Survey Summary

8.2.1 Weeds

There were no Weeds of National Significance (WoNS) recorded during the 2014 survey, however during the field survey in 2010 (AECOM 2012a) African Boxthorn (*Lycium ferocissimum)*, a WoNS (and Declared SA) was recorded. Whilst this species was not recorded during the EBCR survey it should be noted that the native species Australian Boxthorn (*Lycium australe*) was observed at several sites across the CEA, and during recent weed and pest surveys of CUTA (Jacobs 2015c).

During the EBCR survey, three Declared weeds and nine agricultural weed species were recorded, primarily at sites 4 and 5 (Table 8-3). It is likely that historic livestock grazing has increased the disturbance level of the area. In addition, weed infestations were noted of during the 2010 survey for the PER, and this data has been used in conjunction with that of the 2014 survey to inform infestation locations (Figure 8-1).

Table 8-3 List of weed species recorded

Scientific Name	Common Name	Declared Weed Status[1]	PER	Survey Sites (Jacobs 2015)							
				1	2	3	4	5	6	A	C
Asphodelus fistulosus	Onion Weed						Y				
Carrichtera annua	Ward's Weed		Y (widespread)	Y	Y		Y	Y	Y	Y	
Carthamus lanatus	Saffron Thistle			Y				Y	Y		
Centaurea melitensis	Malta Thistle			Y	Y						
Echium plantagineum	Salvation Jane	Declared (SA)					Y				
Emex australis	Three-corner Jack	Declared (SA)					Y				
Lycium ferocissimum	African Boxthorn	Declared (SA)	Y								
Marrubium vulgare	Horehound	Declared (SA)		Y				Y	Y		
Medicago minima	Burr Medic						Y	Y			
Salvia verbenaca	Wild Sage						Y	Y			
Sisymbrium orientale	Indian Hedge Mustard				Y		Y	Y			
Sonchus oleraceus	Common Sow-thistle			Y			Y				

[1] Declared status as per state *Natural Resources Management Act, 2004.*

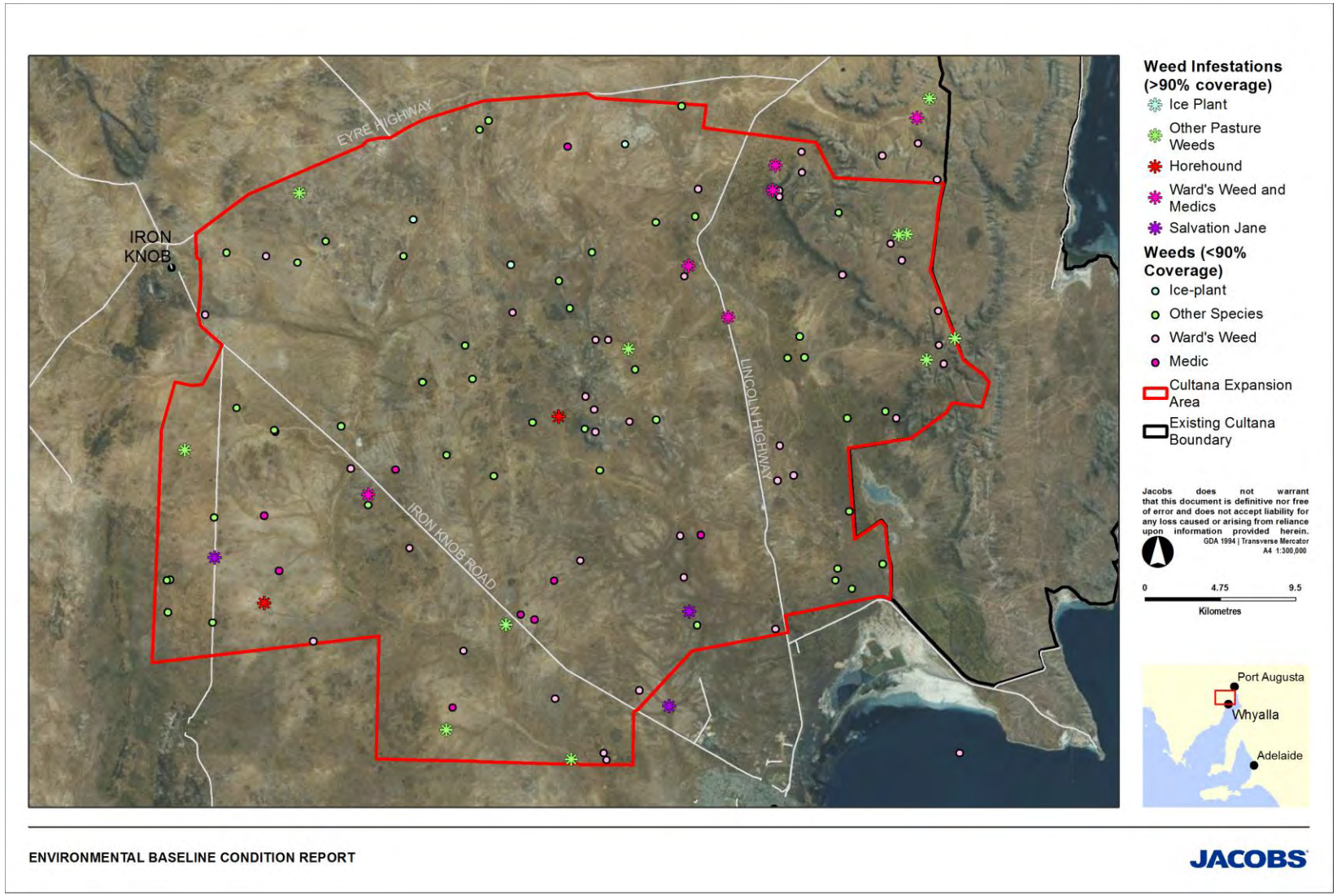

Figure 8-1 Weeds and Weed Infestations across the CEA

8.2.2 Pests

Most of the mammal species anticipated to be present at site were either detected during survey or have been previously detected in the region (i.e. BDBSA, PER). A total of 31 house mice were recorded during the EBCR survey. Mice were present at nearly every site with the exception of site 2 (the only site in close proximity to a major road). Site 1 (Lignum Swamp) had the highest number of House Mouse captures at 16, whilst sites 3, 4 and 5 had lower numbers by comparison (6, 5 and 3 captures respectively) (see Table 8-4).

No significant impacts from introduced mammals were evident within the flora and fauna sites, with only minor evidence of scats and tracks observed which indicated a relatively low active population of Rabbit (primarily at site 5). However, larger numbers of rabbits were present around abandoned homesteads across the CEA (A. Hughes pers. com), near Middleback Field Station and at Site 2 (see Plate 8-1). Goat scats were present at the communication tower and Site 6 (see Plate 8-1).

Minor evidence of cats and foxes were observed during the survey. Only one fox was observed on the Iron Knob to Whyalla Road and several foxes were observed throughout the field surveys. Given the amount of driving across the CEA that was involved for this survey and the environmentally sensitive features, during dawn, dusk and night spotlighting, pest fauna appeared to be present in low numbers.

Similarly, the PER noted the presence of three species of feral mammal; goat, rabbit and fox. The low densities of pest fauna recorded by AECOM (2012a) are consistent with findings of the 2014 survey of this EBCR. The mobile nature and lack of habitat preference for most pest species mean while not observed in field surveys, these species likely occur in low densities across all of the CEA.

Table 8-4 : List of pest fauna recorded

Scientific Name	Common Name	EPBC Threatening Process?	PER Observed?	Survey Sites (Jacobs 2015)						
				1	2	3	4	5	6	Opp
**Capra hircus*	Goat (Feral Goat)	Yes	Yes						Y	Y
**Felis catus*	Domestic Cat (Feral Cat)	Yes							Y	
**Mus musculus*	House Mouse	No		Y		Y	Y	Y	Y	
**Oryctolagus cuniculus*	Rabbit (European Rabbit)	Yes	Yes		Y			Y		Y
**Vulpes vulpes*	Fox (Red Fox)	Yes	Yes							Y
**Ovis aries*	Sheep	No	Yes							Y

Rabbit warren at Site 2

Goat scats at Site 6

Plate 8-1 Evidence of introduced mammals observed in the CEA

Proactive and coordinated pest mammal management will be required, with four of the six pests recorded on site being listed under the EPBC Act for causing a key threatening process:

- Predation by feral cats (*Felis catus*)
- Predation by European red fox (*Vulpes vulpes*)
- Competition and land degradation by rabbits (*Oryctolagus cuniculus*)
- Competition and land degradation by unmanaged goats (*Capra hircus*)

8.3 Overabundant Native Species

Red Kangaroos and Western Grey Kangaroos were observed regularly during 2010 PER monitoring, however not in numbers that could be considered overabundant. A survey conducted in July 2014 investigated large herbivore density at CUTA. Stokes (2014) recorded the abundances of western grey kangaroos, red kangaroos, goats and emus across a series of transects observed via aerial survey, of approximately 128 km^2. It was found that while Western Grey Kangaroos has moderate densities on the property, at 10.2 animals per square kilometre, those densities observed, while moderate, are not high enough to be classified as 'overabundant' (Leigh *et al.* 1989; DTMS 2010). Other large native herbivores identified by Stokes (2014) occurred in densities lower than 2 animals per square kilometre.

This has been verified during the Jacobs 2014 survey, with multiple observations of kangaroo and emus, though not in numbers considered overabundant.

9. Assessment Limitations

The limitations associated with the assessments of the CEA were consistent with most surveys, are as follows:

9.1 Cultural

- Mapping of Indigenous sites (RAs) presented in the IHMP and this report is reliant on third-party digital data or hardcopy, large scale mapping outputs of archaeological and men's and women's anthropological sites obtained from the ICHS1-3 assessments as supplied by Defence. No ground truthing of boundaries has been undertaken. Spatial accuracy will vary based on use of hand-held GPS and manual digitisation of site polygons for archaeological sites.
- Complete survey coverage for Indigenous heritage within the CEA was not obtained on account of focus on landforms which were more likely to contain Indigenous archaeological sites and landscapes informed by Indigenous stakeholders to be culturally significant places (IHMP, Jacobs 2015b). The extent of the CEA project area also limited full survey inspection of the ground surface during the ICHS1-3 surveys (Jacobs, 2015b).
- While a heritage desktop (SoE Report), heritage impact assessment and archival photographic recording has been undertaken for the CEA, no overall heritage management plan has been prepared. The heritage impact assessment does not include any assessment of other historical stations (Lincoln Station/Katunga Station); fence or water infrastructure apart from the Middleback, Roopena and Tregalana pastoral complexes and the Whyalla Gliding Club.
- Oral history recording with pastoral owners was not undertaken as part of the historical impact assessment, however further detailed information on features and structures was obtained from the valuation reports informed by the former pastoral families.
- As a result of vandalism to pastoral homesteads and the surrounding structures, the heritage values of the pastoral complexes have been compromised prior to field assessment. Archival photographic recording of the historical heritage sites was limited as most of the contextual record of pastoral machinery had been removed prior to assessment.

9.2 Environmentally Sensitive Features

- Site access limitations (and the limitations of the scope for the study) meant that not all sites identified through remote sensing could be ground-truthed (i.e. visited 'on-ground'). However, a significant proportion of sites were able to be ground-truthed
- Time of capture from imagery used in initial environmentally sensitive features remote sensing classification may not fully represent the condition of features throughout the year
- Production of certain data through digitisation (i.e. georeferencing hard copy maps not accompanied by an electronic spatial dataset)
- Investigations into potential contamination sites were qualitative and did not involve comprehensive preliminary or detailed site investigations in accordance with the ASC NEPM (NEPC, 1999). Investigations in accordance with the ASC NEPM would need to be carried out in order to accurately determine the existence and extent of site contamination within the study area.

9.3 Flora and Fauna

- Fauna and flora surveys often have inherent limitations due to the high level of diversity and complexity of ecological systems. Random or systematic errors are prevalent when sample sizes are small, and where location is an issue.
- Results are only a 'snapshot' in time and cannot describe seasonal variation or migrations.
- Scats could not always be correctly attributed to species, however where they could be confidently identified, they provide an accurate indication of the presence and habitat preferences of certain species (Triggs 1996).

- Detection of nocturnal species by spotlighting potentially does not detect all of the animals present and is affected by environmental factors (Wayne *et al*. 2005).
- Read & Moseby (2001) concluded that environmental factors affected the capture rates of small reptiles. Unfortunately, planning logistics for fauna surveys around specific environmental conditions is very difficult. Planning to survey when weather conditions are generally favourable (as was done here) allows the best chance of favourable conditions during a survey and species identification. It is noted that daily conditions were considered mostly favourable for reptiles during this survey, with two hot days potentially limiting the fauna capture.
- Many flora species, including orchids or ephemeral plants, may not have been detected during the survey due to dormancy. As such, flora species may be lower than in reality due to an inability to detect these species.
- No assessment of subterranean or invertebrate fauna was carried out.
- No assessment of fungi and non-vascular fauna was carried out.
- Migratory waterbirds were not actively sought in this survey as the CEA boundary does not come within 1km of the coast line. Those observed in this study were done so opportunistically from farm dams.

10. Matters of conservation significance

10.1 Cultural Heritage

10.1.1 Indigenous heritage

Following a desktop review of all prior Indigenous heritage assessments (both anthropological and archaeological) within the CEA, including an updated search of State and Commonwealth heritage registers on 6 November 2014, a total of 64 RAs has been established for the CEA and documented in Appendix E of the IHMP (Jacobs, 2015b). The overall total number of RAs inclusive of the existing CUTA training area) is 83 and the mapping provided below demonstrates the cultural heritage values within the CEA which require ongoing management by Defence in accordance with the IHMP, ILUA and State legislation.

Comprehensive RA mapping has been undertaken to determine the nature and extent of RAs within the CEA so that effective cultural heritage management actions can be applied during Defence training operations and contractor activities (Jacobs, 2015b). Specific conservation measures, cultural significance and management requirements for each RA are listed in the RA register within Appendix E of the IHMP. In some cases the cultural heritage significance of the site(s) require that this information is kept confidential according to that Indigenous group and so will be removed from the register according to the request of that group. RA boundaries have been derived based on the methodology outlined in Section 1.5 of the IHMP and the recommendations discussed with the relevant Indigenous stakeholders during the ICHS1-3 clearance surveys.

Indigenous heritage management and conservation aims to preserve the relationship between Indigenous people and their heritage places (Godden Mackay Logan 2009). The Burra Charter (The Australia ICOMOS Charter for Places of Cultural Significance 1999) states that 'cultural significance' means aesthetic, historic, scientific, social or spiritual value for past, present or future generations. Section 528 of the *EPBC Act* defines the Indigenous heritage value of a place that is of significance to Indigenous persons in accordance with their practices, observances, customs, traditions, beliefs or history. Indigenous heritage significance incorporates the 'intrinsic value of physical sites , the attachment to places in the landscape with ceremonial or story attachments without physical evidence, spirituality, law, knowledge practices, traditional resources or other beliefs or attachments' (DoD 2014).

In accordance with the *Defence Heritage Toolkit*, the assessment of Indigenous significance values are undertaken during the heritage assessment of sites, including tangible evidence such as archaeological sites and objects or intangible heritage such as spiritual or sacred values (DoD 2014). The heritage assessment determines and assesses any heritage significance at a site on accepted standards provided by the CHL criteria.

The CHL was created under the *EPBC Act* as a statutory list recognising places of Commonwealth heritage value which are owned or controlled by the Commonwealth government. Such places are called a 'Commonwealth heritage place' if it meets one or more of the CHL criteria (section 341C of the *EPBC Act*). Defence has produced Defence Guidelines on Assessing Significance (Godden Mackay Logan 2009). These guidelines provide criterion based on those defined for the CHL as follows:

a) Historical
b) Rarity
c) Scientific
d) Representativeness
e) Aesthetic
f) Technical
g) Social
h) Associational
i) Indigenous

Defence acknowledges that any assets with known Commonwealth Heritage values (listed on the CHL) or potential Commonwealth Heritage values (not yet assessed and/or listed on the CHL) are protected under the *EPBC Act*. Defence treats those places with potential Commonwealth Heritage values or on the Register of National Estate as if they are on the CHL.

Section 5.2 of the IHMP provides a statement of indigenous heritage significance which outlines the Indigenous heritage values of the CEA as a 'cultural landscape'. This reflects the original assessment by AECOM (2012b) that the CEA should be viewed through the '…lens of a cultural landscape…' to provide Defence with a more sophisticated framework with which to both manage the CEA and educate ADF end users during exercises.

10.1.2 Historical heritage

The recommendations of the heritage impact assessment undertaken of the Middleback, Tregalana and Roopena pastoral complexes completed in late February 2015 and results regarding the level of significance of these homesteads and adjoining pastoral outbuildings are to be confirmed. A significant number of pastoral buildings were recorded at all three pastoral complexes and initial results suggests that the historical sites will be accorded at least local heritage significance based on Commonwealth heritage criteria. Heritage significance of the Former Whyalla Gliding Club is likely to be of local significance only.

Given the recording of an early 20th century artefact scatter (archaeological deposit) at Middleback Station (Appendix C) there is a likelihood that further archaeological deposits from occupation at each of the three stations may be found during demolition or construction activity. Management of known archaeological deposits, recorded gravesites and contingency measures for historical heritage recorded during activities within the pastoral sites is outlined in the heritage impact statement for the CEA (refer Section 11.1).

The homestead, woolshed and the surrounding outbuildings at each of the three stations are of at least local historical significance as they demonstrate an ongoing use for the operation of the key historical activity of the region, pastoralism. The Middleback and Roopena stations have a strong long term association with the Nicolson family who were key figures in the development and innovation of the wool industry in the region. The pastoral stations demonstrate the principal characteristics and layout of large, remote sheep properties dating from the early 20th century.

10.2 Significant Flora Summary

10.2.1 Significant flora or communities confirmed as present

No flora species or ecological communities of national conservation significance were identified within the CEA boundary during the 2014 EBCR survey. Similarly, no such species were recorded during surveys for the PER.

One flora species of state conservation significance was identified during the 2014 EBCR survey; Sandalwood (*Santalum spicatum,* Vulnerable). This species was twice observed opportunistically near flora site B during the field survey. The PER also recorded this species at 10 sites, and there are multiple recent (post 2000) BDBSA records within 5 km of the CEA. Sandalwood occurs in arid and semi-arid districts of South Australia and is commercially harvested for fragrant timber and oil (Berkinshaw 2009). This species occurs rarely in South Australia, on a variety of soil types, and is listed as Vulnerable under the SA NPW Act. Sandalwood also has importance in Aboriginal culture. This conspicuous species is likely to be present at other localities within the study area.

Two additional flora species of state conservation significance were recorded during the PER survey in 2010; Flinders Ranges Wattle (*Acacia iteaphylla* – Rare), and Spreading Cress (*Phlegmatospermum eremaeum* – Rare in SA). The wattle is known in semi-arid regions, growing mainly along rocky outcrops or hillsides along creeks in valleys. Spreading Cress is a rarely collected species found in semi-arid regions on stony loam soils. It is likely these species occur in isolated patches on site. Only one observation was made of each species on site.

10.2.2 Significant flora or communities likely to occur

Based on desktop review (PER and BDBSA) and 2014 EBCR, one nationally protected flora species has potential to occur, and three state protected flora species are likely to occur (Table 10-1).

There are no threatened ecological communities that have the potential to occur, however a TEC of Subtropical and Temperate Coastal Saltmarsh (Vulnerable) was recorded during the 2014 EBCR field survey less than 500 metres south of the CEA boundary. While not within CEA boundary, there remains potential for indirect negative impacts on this TEC through some training exercises in close proximity to the upstream tributaries. Defence currently do not have any formal facilities / infrastructure in this vicinity, therefore impacts on this TEC are likely to be negligible or short-term following training exercises.

Table 10-1 Threatened EPBC and State listed flora species likely to occur

Species Name	Common Name	EPBC Act[1]	SA NPW Act[2]	EPBC Likelihood of Occurrence	Most recent BDBSA record	Reason likely
Brachyscome muelleri	Corunna Daisy	EN	EN	Species or species habitat likely to occur within area	22/08/1983	An annual daisy known to associate with rocky outcrops and Acacia vegetation. Closest record is 4.5 km to the north-west of CEA.
Centrolepis cephaloformis ssp. cephaloformis	Cushion Centrolepis		R	Not listed	8/09/1974	This species is present in mallee woodland, clay pan edges and saltmarshes. Closest record is 4.5 km to the north-west of CEA.
Crassula exserta	Large-fruit Crassula		R	Not listed	8/09/1974	A small annual species, widespread across the EP often growing with C. colorata and C. sieberana subsp. tetramera. Closest record 4.5 km to the north-west of CEA, however other Crassula sp. recorded within boundary.
Rumex dumosus	Wiry Dock		R	Not listed	7/11/1936	Perennial winter species, preferring drainage lines. Closest record 2 km to west near Iron Knob.

[1] National *Environment Protection and Biodversity Conservation Act* 1999 (EPBC Act) status: Endangered (EN), Vulnerable (VU);

[2] South Australian *National Parks and Wildlife Act 1974 (*NPW Act) status: Endangered (E), Vulnerable (V), Rare (R),

[3] State Herbarium of South Australia / Biological Database South Australia (BDBSA)

10.2.3 Significant flora or communities unlikely to occur

Four EPBC listed flora species were suggested by the EPBC Protected Matters Search Tool or had historical records in the area. However based on known recent distributions, recent BDBSA records, regional surveys and recent field surveys (including the PER) is considered that three of these species are unlikely to occur within the CEA:

- Greencomb Spider-orchid (*Caladenia tensa*)
- *Frankenia plicata*
- Ooldea Guinea-flower (*Hibbertia crispula*)

It is unlikely that critical habitat for these species occurs within the site. If they did occur, they would be isolated individuals and would not be part of core populations.

10.3 Significant Fauna Summary

10.3.1 Significant fauna confirmed as present

Six fauna species of conservation significance have been confirmed as present in the CEA.

One (1) nationally listed bird species was recorded at multiple sites throughout the CEA; the Western Grasswren (Gawler Ranges subspecies, *Amytornis textilis myall*, EPBC Vulnerable). This species was observed at sites 1 and 5, but likely occurs in multiple areas across the site due to high coverage of chenopod and saltbush shrublands (see Table 10-2 for known habitat requirements).

Two state listed birds were also recorded during the EBCR field survey; Gilbert's Whistler (*Pachycephala inornata*, SA Rare) at Site 2 and 4, and Slender-billed thornbill (*Acanthiza iredalei iredalei,* SA Rare) at Site 3. In addition, the PER study observed Major Mitchell's Cockatoo (*Cacatua leadbeateri,* SA Rare), White-browed Treecreeper (*Climacteris affinis*, SA Rare) and an Australasian Shoveler (*Anas rhynchotis,* SA Rare) (see Table 10-2 for known habitat requirements).

Table 10-2 Habitat requirements of observed fauna of conservation significance

Common Name	Species Name	EPBC Act[1]	NPW Act[2]	Site observed	Habitat requirements
Western Grasswren (Gawler Ranges subspecies)	*Amytornis textilis myall*	V		1, 5	Known to occur in open chenopod, or saltbush shrublands, often surrounding drainage lines with a sparse or open overstory or low trees or shrubs [3].
Gilbert's Whistler	*Pachycephala inornata*		R	2, 4	This species generally occurs in shrubby semi-arid mallee woodland or acacia shrublands usually with a dense, continuous or patchy understory of shrubs [4].
Slender-billed thornbill	*Acanthiza iredalei iredalei*		R	3	Known to occur in arid and semi-arid samphire near salt pans, chenopod shrublands dominated by saltbush and bluebush, and occasionally in acacia shrublands adjacent to preferred habitat [4, 5].
Major Mitchell's Cockatoo	*Cacatua leadbeateri*		R	PER	Restricted to arid and semi-arid inland areas of Australia and known to prefer woodland habitats including Mallee (Eucalyptus species), mulga, Murray Pine (Calitris) and She-oak (Casuarina). Breeding areas are known to occur in the upper Eyre Peninsula [5].
White-browed Treecreeper	*Climacteris affinis*		R	PER	Known to prefer shrublands and tall woodlands in arid and semi-arid region including Mulga, Western Myall and

Common Name	Species Name	EPBC Act[1]	NPW Act[2]	Site observed	Habitat requirements
					Casuarinas[4, 5].
Australasian Shoveler	*Anas rhynchotis*		R	PER	Restricted to wetland environments including heavily vegetated swamps, farm dams and tidal flats[5].

[1] Australian EPBC Act Status: Vulnerable (VU)

[2] South Australian NPW Act Status: Rare (R), Vulnerable (V)

[3] DoE 2014

[4] BirdLife 2006

[5] Simpson and Day 2004

In addition, three bird species were observed that have subspecies with ratings under the NPW Act, however the known extent of the listed species do not align with the location of the CEA, where the common subspecies occur: Bluebonnet at Site 5, Grey Currawong at Site 3, Jacky Winter at Site 2, 3, 4 and 5 (see Section 10 for further detail). In addition, during the PER survey the state listed Hooded Robin (*Melanodryas cucullata*) and Chestnut Quail-thrush (*Cinclosoma castanotum*) (AECOM 2012a) were observed. However these species are listed at the subspecies level and it is likely the more common species were observed in the CEA. BDBSA records also exist for these state listed species but the records provide no additional information on which subspecies was observed. Based on distributions presented in Simpson and Day (2004) and Vertebrate Census (SA Museum, 2009), it is likely the BDBSA records are for the common subspecies that have no formal legislative protection due to the CEA being outside of the known range of the listed subspecies.

10.3.2 Significant fauna likely to occur

Three EPBC listed fauna (all birds) and two NPW listed fauna species were not recorded during the EBCR survey of 2014 or during the surveys for the PER, however they do have the potential to occur in the region and are worth future consideration based upon habitat preferences, feeding / shelter requirements or physical conditions found in the study area. Those species that are likely to occur are discussed in Table 10-3.

Table 10-3 Significant fauna species considered likely to occur within the CEA

Common Name	*Species*	EPBC Status[1]	NPW Status[2]	Justification for likelihood
Malleefowl	*Leipoa ocellata*	V, MT	VU	Malleefowl are known to inhabit sandy dune habitats throughout the far west and northern Eyre Peninsula, as well as throughout scattered mallee vegetation communities in the central west Eyre Peninsula region. Long-unburnt mallee communities provide the most suitable habitat requirements for this species. Where habitat is adjacent to cropping areas, malleefowl have also been known to feed upon grains from these areas (Benshemesh 2007). Malleefowl have declined in overall range and it is thought that several key threatening processes include: clearance of remnant vegetation and associated habitat fragmentation; inappropriate fire regimes; predation and competition from feral mammals. Targeted searches did not locate this species within the CEA. Site 3 contained old growth mallee with good litter cover and sandy substrates. It is considered likely that this species occurs in old growth mallee in the study area.
Rainbow Bee-eater	*Merops ornatus*	MT	-	Widely distributed migratory species that uses most habitat types, including woodlands, shrublands, and various cleared and semi-cleared habitats (SPRAT). Breeding populations inhabit Southern Australia are known to migrate north during the southern winter (SPRAT). Species is highly mobile and wide ranging across Southern Australia, and has been recorded migrating to northern Australia, Papau New Guinea, Indonesia and as far north as Japan. No BDBSA records within CEA, closest record 18 km to the north-east. Not observed during the field survey. Potential impacts caused by human activity aren't widely documented but are not currently considered to be threatening. Has ability to use a wide range of habitat types over a large range. It is likely that this species still occurs in the area, but the CEA is unlikely to provide core habitat for the species.
Australian Bustard	*Ardeotis australis*		V	This species is known to occupy grasslands, low shrublands, grassy woodlands and artificial habitats including croplands as well as open and sparsely vegetated areas, where they feed on insects, small vertebrates, seeds and fruits (Simpson and Day 2004). They are known to occur in the far west of South Australia in the arid zone (AWNRMB 2011). There is a BDBSA record in the CEA for this species from 2006 near Pandurra station. Not recorded during previous surveys (e.g. PER), however further recent BDBSA records exist for this species with 5 km of the CEA boundary (2005 and 2003). It is likely that this species still occurs in the area, but it is unlikely that the CEA provides core habitat for the species.
Fork-tailed Swift	*Apus pacificus*	MM, LM	-	Known to use many habitat types, including coastal, arid and urban areas of Australia and internationally (Simpson and Day 2004). Migrates across broad regions of Australia and consequently, it is expected that suitable habitat exists within the study area for this species, even if of a temporary nature. It is not expected that this species would be solely reliant upon habitat found within the CEA.

				No BDBSA records within the CEA, but 3 BDBSA records within 5 km of the CEA boundary. Not observed during the field surveys. It is likely that this species still occurs in the area, but the it is unlikely that the CEA provides core habitat for the species.
Elegant Parrot	*Neophema elegans*	-	Rare	Occurs in open country and semi-arid scrublands. Occurs in two disjunct regions, one across south Western Australia from Moora in the north to Merredin and Esperance in the east, and in south eastern South Australia north to Marree, and east into western Victoria. Was not recorded within the study area. Requires hollows higher than 15 m above the ground in a riparian tree (usually a gum or stringybark forest), for breeding. Such habitat is does not occur within the CEA. Unlikely to breed within the CEA, but may occur as an occasional visitor. There are multiple BDBSA records in and surrounding the CEA, the most recent from October 2008.

[1] National *Environment Protection and Biodversity Conservation Act* 1999 (EPBC Act) status: Endangered (EN), Vulnerable (VU), Migratory Terrestrial (MT);

[2] South Australian *National Parks and Wildlife Act 1974 (*NPW Act) status: Endangered (E), Vulnerable (V), Rare (R),

10.3.3 Significant Fauna Unlikely to Occur

Forty-three fauna listed species identified by the PMST and BDBSA Data are unlikely to occur within the CEA. This includes 35 Migratory Marine and Listed Marine species. Some of the species identified in the PER are transient and or are not known to be present in the wider region. Justification for the unlikely species and likelihood of occurrence within the project area are discussed in Appendix J.

10.4 Pressure and Impact Assessment on Significant Flora and Fauna

Ecological values are influenced by a wide range of pressures meaning a change in biodiversity is unlikely to be attributed to a single pressure and impact but rather a combination of pressures and impacts, as well as potential variables beyond the control of Defence (e.g. climate change, drought). Pressures and impacts on terrestrial ecological values (flora and fauna) may arise through the construction and operation of potential Defence infrastructure. These are summarised in **Table 10-4** below.

10.4.1 Sources of pressure and potential impacts

Impacts to flora and fauna associated with the proposed Defence infrastructure may result from construction and operation activities of the Defence site. The sources of impacts for each project component are summarised below:

- Vegetation clearance required for construction
- Habitat fragmentation as a result of vegetation clearance
- Direct or indirect mortality (general fauna and conservation significant species)
- Direct or indirect disturbance (listed flora)
- Noise disturbance (fauna)
- Dust emissions (vegetation)
- Spread of weeds and pests

Clearance of native vegetation will be required for construction of Defence training infrastructure. This will result in habitat fragmentation and potential direct or indirect mortality of general and conservation significant fauna. Noise disturbance during construction and operation may impact fauna in the area, however mobile fauna would likely move away from noise disturbance into surrounding habitat. Similarly, dust created during construction and operation is likely to impact on vegetation in the area. During construction activities weed introduction and spread can occur via spread of weed supporting material (e.g. soils containing seeds, propagules) and an increase in available habitat for weeds following vegetation clearance (e.g. for road development, range patrol, and maintenance of tracks etc). Vertebrate pests already occur within the CEA, and it is likely that increased disturbance will increase opportunities for these pests to become established. In particular, if dams are decommissioned rabbit and weed control will be required as old dams provide bare earth suitable for warren establishment and weed incursion (as reported for CUTA during recent weed and pest surveys (Jacobs 2014).

Table 10-4 Pressures likely to affect biodiversity

Pressure	Positive Impact Comments	Negative Impact Comments
Construction of support infrastructure	**Staging construction, particularly vegetation clearance and noisy activities, will minimise impacts to fauna.**	**New permanent infrastructure / assets.** Vegetation clearance, trimming and cover / habitat loss, soil compaction, increased fire risk, altered fire regimes to protect assets, increased habitat fragmentation, potential loss of threatened species, new structures providing harbor for rabbits and cats
Change in land use	**Destocking**. Vegetation under reduced sheep grazing pressure provided pest and overabundant native herbivores are also managed; increased native recruitment and vegetation cover, improved cover and condition of palatable species, improved biodiversity, reduced competition for resources for native species.	**Live firing / explosives.** Increased risk of fire, disturbance / displacement of native fauna through noise / vibration. **Shift to periods of intense disturbance / impact.** Potential decline in condition and diversity of very slow-growing, flora.
Defence activity in the CEA	**Proactive, long term approach to biodiversity management** through implementation of EMFs and range standing orders, adoption of an adaptive management approach informed by ongoing monitoring, consistent and coordinated management over the whole training area.	**Vehicle movement (truck, tanks, four-wheel drives).** Vegetation damage and cover / habitat loss or modification, increased erosion / dust, introduction of foreign soils and weeds, proliferation of existing weeds, soil compaction with formation of new access tracks. Disturbance / displacement of native fauna through noise / vibration, fauna lost through road kill and potential for scavenging pest fauna to proliferate **Infantry movement.** Vegetation damage and cover / habitat loss or modification, increased erosion / dust, introduction of foreign soils and weeds, soil compaction around assets and camp grounds.
Increased number of Defence employees	**Improved detection of land condition and maintenance issues (e.g. weed and pest incursions).** Faster intervention, minimised impact, improved treatment efficacy.	**Waste**. Increased human activity and waste attracting cats and foxes leading to potential loss of native fauna.

11. Summary and Conclusions

Desktop and field surveys were undertaken for the CEA assessing Cultural Heritage, Contaminated Land and Flora and Fauna in the region in order for Defence to fulfil Condition 11 of the EPBC Act Approval (2013). The sites were selected to provide broad coverage across major vegetation community types, to assess the varying environmental condition across the CEA. Data from the 2010 PER has been used as a baseline on which to build this EBCR. Cultural studies, through the production of an Indigenous Heritage Management Plan (Jacobs 2015a), and contaminated land assessment, a general overview of the environmental baseline condition of the CEA has been gained.

11.1 Cultural Environment

The existing cultural heritage environment of the CEA can be summarised as follows:

- There are 55 recorded archaeological sites and 92 anthropological sites recorded or reinspected between 2007 and 2014 within the CEA. These sites have been spatially grouped into 64 RA areas within the CEA to reflect the Indigenous site management approach of the existing CUTA IHMP
- The assessed historical heritage includes three pastoral complexes (Middleback, Tregalana and Roopena). Additional pastoral stations are located at Lincoln Park and Katunga
- The indigenous cultural values range from low density artefact (lithic) scatters, quarries and stone arrangements to particular mythological landforms such as cane grass swamps, clay pans, creek catchments, prominent hills, rock outcrops and ranges
- Historical cultural values represented in the CEA predominantly reflect pastoral activity with key elements including main station dwellings, woolsheds, blacksmith sheds, shearing quarters, ablutions blocks, crutching sheds, early fencing, cemeteries (grave/memorial enclosures and for working dogs); evidence of early 20th artefacts and stone structures (fireplace/oven). While there is extensive pastoral fencing and water infrastructure associated with the homesteads, the historical features within the CEA are focussed around the homestead and associated wool industry (shearing quarters and woolshed sub-complexes)

Threat of impact to Indigenous heritage within the CEA will be managed through the recommendations of the IHMP including application of the CATP for all users, acknowledgement of RA locations within Range Standing Orders (RSOs) and processes to inform users prior to training activities and ongoing consultation with the Indigenous Stakeholders via the prescribed cultural heritage requirements outlined in the ILUA agreement. Ongoing heritage maintenance cycles and actions are also outlined in the IHMP (refer Jacobs 2015a).

Impact to historical heritage (pastoral complexes) within the CEA will be managed through completion of a comprehensive archival photographic recording report in accordance with the Defence Heritage Toolkit requirements and heritage impact assessment recommendations providing mitigation measures including avoidance of demolition or construction impact on key elements such as grave sites, artefact scatter(s) and any significant heritage items which can be retained.

11.2 Regional Environment

The current land condition has been shaped by long term low to moderate agricultural sheep grazing activity, which was ceased shortly after acquisition. The site is now in a state of transition. The existing environment across the CEA can be summarised as follows:

- Comprises five distinct IBRA regional native vegetation associations, all of which are poorly conserved across the larger EP region by formal reserves, parks or heritage agreements
- Environmental habitats are in a similar condition and consistent with those found commonly throughout the local region where agricultural enterprise is historic and ongoing
- No environmental habitats are unique to the CEA and thus at high risk from future land use
- Habitats are under low natural grazing pressure from Kangaroos, and low pest grazing pressure (goats, rabbits)

11.3 Environmentally Sensitive Features

11.3.1 Land Contamination

Land contamination occurrences were largely localised to homesteads and surrounding outbuildings and infrastructure, and the former Whyalla Gliding Club. It is now known whether groundwater contamination associated with the identified PCAs is present beneath the CEA, but would likely be minor and low risk. There is potential for the presence of ACM related land contamination around existing agricultural buildings (from asbestos fibres and / or ACM fragments generated by such things as vandalism, maintenance activities and / or general degradation).

11.3.2 Clay Pans, Highly Erodible or Saline Soils

Clay pans and highly erodible or saline soils have been identified as an environmentally sensitive features when assessing baseline conditions across the CEA (refer Jacobs 2015b). These occur as follows:

- A total of 11 clay pan areas were identified across the CEA (refer Figure 5-1)
- There was minor existing erosion identified across the CEA, most commonly associated with tracks that traverse ephemeral creeklines or low lying areas (e.g. flood plains), and on or adjacent man-made earthen features (e.g. dam walls)
- One ephemeral salt lake in north-eastern corner of the CEA, and a second (minor) area of potential saline soil to the southeast of the salt lake. No other evidence of saline soils was found on site.
- No natural permanent water bodies were identified on site; multiple minor ephemeral drainage lines throughout
- Farm and paddock dams are remnant across the CEA
- Highly erodible soils are present in a number of isolated patches, typically where there is a concentration of ephemeral creek lines and sparser vegetation cover

11.3.3 Existing Environmental Threats

A number of 'Key Threatening Processes' (EPBC Act) were observed during the 2014 field survey. These threats have potential to impact the fauna / flora and vegetation communities. These are:

- Predation by feral cats, existing numbers within the CEA are considered to be low
- Predation by European red fox, existing numbers within the CEA are considered to be low
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants, e.g. Carrion Flower (*Orbea variegata*). No evidence of this species was observed during the EBCR survey or reported in the PER, however this species is known to occur within and adjacent CUTA
- Competition and land degradation by rabbits, existing numbers across the site were low, but numbers are expected to be higher near abandoned homesteads. Future issues may occur in decommissioned dams
- Competition and land degradation by unmanaged goats; existing numbers within the CEA are considered to be low
- Land clearance (also listed by the Eyre Peninsula Natural Resource Management Board, EP NRM 2009) as the most significant threat to biodiversity on the Eyre Peninsula. Existing clearance within the CEA is low and relates to homesteads, dams (approximately 70) and off-road tracks. Land clearance for Defence infrastructure will be a key threat to the flora and fauna observed as discussed in 10.5.1. Utilising existing tracks and the land cleared for existing homesteads would reduce this threat to the flora and fauna of the CEA.

In addition, other environmental threats such as fire and utilisation of roads (e.g. direct fauna fatalities) are present on the CEA. The old growth mallee identified in the south-west of the site have growth suggesting it has been more than 100 years since a fire came through, however the eastern patch indicates a shorter time since it was burnt. A decrease in grazing pressure, and expected increased understory growth as a result, an increased

fire risk will be present if not properly maintained. Inappropriate fire regimes are listed in EP NRM (2009) State Of Our Resources report as the second most prevalent threat to biodiversity on the Eyre Peninsula.

Weeds are also an existing threat within the CEA, summarised as follows:

- 49 weeds have been recorded to date
- There are records for two WoNS / Declared weeds
  - African Boxthorn (*Lycium ferocissimum*)
  - Prickly Pear species (*Austrocylindropuntia* spp., *Cylindropuntia* spp., *Opuntia* spp.)
- and records for four other Declared weeds
  - Three Corner Jack (*Emex sp.)*
  - Salvation Jane (*Echium plantagineum*)
  - Horehound (*Marrubium vulgare*)
  - Bathurst Burr (*Xanthium spinosum*)

11.3.3.1 Vegetation communities and floral diversity

Overall, 396 flora species (347 native and 49 exotic) have been confirmed to occur within the CEA (AECOM 2012a, Jacobs 2015a), see Appendix N for full list) by recent survey efforts). Of note:

- No vegetation species of national conservation significance have been observed (EPBC Act)
- A threatened ecological community of Subtropical and Temperate Coastal Saltmarsh was located immediately south of the CEA boundary, but not recorded within the CEA. This subtidal community is unlikely to be impacted with no major infrastructure envelopes or activities planned in the CEA area immediately adjacent.
- Three species of state conservation significance have been observed (NPW Act); Sandalwood (*Santalum spicatum,* vulnerable), Flinders Ranges Wattle (*Acacia iteaphylla*, rare), and Spreading Cress (*Phlegmatospermum eremaeum*, rare). Sandalwood occurs as scattered individuals across the site in multiple locations (refer Figure 7-2). Flinders Ranges Wattle occurs along the old stock route and is likely introduced to site by previous stock movements (PER 2012). Spreading Cress is a rarely collected species found in semi-arid regions on stony loam soils.
- While not recorded by recent surveys, 4 species of conservation significance are considered likely to occur due to the presence of suitable habitat to support these species (refer Table 10-1).

Eleven (11) vegetation community types have been recorded in the CEA, four being dominant across much of the site (Jacobs 2015a, AECOM 2012a – refer Appendix G):

- Boree +/- Yorrell mallee tall open shrubland
- Woodlands and mallee with mid-dense sclerophyll shrub understorey
- Boree over bluebush low open shrubland
- Boree with emergent red mallee
- Chenopod open shrublands, dominant across the CEA
- Red mallee +/- yorrell mallee with chenopod understorey, patchy distribution
- Western myall +/- false sandalwood low open woodlands, dominant across the CEA
- Black oak open woodland and woodland with chenopod shrub understorey, patchy distribution
- Bladder saltbush shrubland, dominant across the CEA
- Bluebush shrubland, dominant across the CEA
- Lignum open shrubland swamp, primarily in drainage lines and drainage areas

The Lignum open shrubland and mallee patches are important habitats for native birds, while the mallee and black oak woodlands are important habitats for bats. Chenopod shrublands (widespread) were found to support Western Grasswren (Gawler Ranges subspecies), which is vulnerable under the EPBC Act. Further state listed species were supported by similar chenopod shrublands and mallee open woodlands.

11.3.4 Habitat condition within the CEA

Whilst areas in the immediate vicinity of some livestock watering points have been highly disturbed and are considered to be in poor condition, overall habitat condition is considered to be moderate to good throughout the CEA as evidenced by the following:

- Soil surfaces are stable with widespread crusting, abundant litter levels and little evidence of accelerated erosion
- Palatable flora species are present in mixed-age stands, indicating on-going seedling recruitment
- Native species richness is comparable to benchmark sites in previous surveys (AECOM 2012a & Milne *et al.* 2008)
- Total grazing pressure is low with only light browsing of palatable species recorded
- Declared weed infestations occur at low levels
- Pest fauna species occur at low levels, with the exception of abandoned homesteads

11.3.4.1 Diversity and abundance of fauna

A total of 144 (103 birds, 22 reptiles and 19 mammals) vertebrate species have been confirmed to occur within the CEA (see Appendix M for full list), summarised as follows:

- 44 fauna species were identified during the PER survey of 2010
  - Three fauna species of state conservation significance were recorded in the study area: Major Mitchell's Cockatoo (*Cacatua leadbeateri,* SA Rare), White-browed Treecreeper (C*limacteris affinis*, SA Rare) and an Australasian Shoveler (*Anas rhynchotis,* SA Rare) (see Table 10-2 for known habitat requirements).
- 96 vertebrate species (including results from bat call data and pest species) were recorded within the CEA during the 2014 EBCR survey
  - Avian fauna made up the majority of the vertebrate species observed (62%) during the EBCR survey.
  - One species listed under the EPBC Act was recorded at multiple sites: Western Grasswren (*Amytornis textilis myall*).
  - Two other species protected under the state NPW Act were recorded across the study area: Slender-billed Thornbill (*Acanthiza iredalei iredalei*), Gilbert's Whistler (*Pachycephala inornata*).
- There are no records for mammals or reptiles of conservation significance within the CEA
- Fauna species diversity is consistent with the condition of the local environment that generally endures very dry conditions, and historical grazing disturbance

11.4 Protected Species and Other Matters Summary

The status of protected flora and fauna species and other matters (listed under the EPBC Act) and threatened species (listed under the NPW Act) within the CEA are summarised as follows:

- EPBC Act
  - No EPBC listed flora were recorded during the EBCR or PER surveys
  - One EPBC listed flora, not recorded during the EBCR or PER surveys, is considered likely to occur with the CEA, Corunna Daisy (*Brachyscome muelleri:* Endangered)

- No EPBC list ecological communities were recorded during the EBCR or the PER surveys. A threatened ecological community of Subtropical and Temperate Coastal Saltmarsh was located south of the CEA boundary, but not recorded within the CEA
- One EPBC fauna was observed during the EBCR and PER surveys, Western Grasswren (*Amytornis textilis myall*: Vulnerable)
- A further three EPBC listed fauna species, not recorded during the EBCR survey or the PER surveys, but are considered likely to occur within the survey area; namely Fork-tailed Swift (*Apus pacificus:* Migratory Marine / Listed Marine), Rainbow Bee-eater (*Merops ornatus:* Migratory Terrestrial) and Malleefowl (*Leipoa ocellata:* Migratory Terrestrial / Vulnerable). Although not observed, Malleefowl are likely to occur throughout the region where there are areas of long unburnt mallee with good litter cover and sandy substrates
- An additional five EPBC listed fauna species, not recorded during the EBCR survey or the PER survey, are considered possible to occur within the survey area; Cattle Egret (*Ardea ibis*: Listed Marine), Little Egret (*Egretta garzetta*: Migratory Marine / Listed Marine), Osprey (*Pandion haliaetus / cristatus*: Migratory Marine / Listed Marine), White-bellied Sea-eagle (*Haliaeetus leucogaster*: Migratory Terrestrial / Listed Marine) and Sandhill Dunnart (*Sminthopsis psammophila*: Endangered) (see Appendix J for habitat requirements and justifications)
- A total of 35 EPBC listed fauna are considered unlikely to occur within the CEA. Justifications for unlikely occurrence are provided in Tables J1 and J2 within Appendix J
- No other protected matters occur on site.

- NPW Act
  - Three state listed flora have been recorded within the CEA; Sandalwood, Flinders Ranges Wattle and Spreading Cress.
  - A further three flora species of state conservation significance are considered likely to occur within the CEA; Cushion Centrolepis (*Centrolepis cephaloformis ssp. Cephaloformis:* Rare), Large-fruit Crassula (*Crassula exserta:* Rare) and Wiry Dock (*Rumex dumosus*: Rare).
  - Five NPW listed fauna species were observed during the EBCR and PER; Gilbert's Whistler (*Pachycephala inornata:* Rare), Slender-billed thornbill (*Acanthiza iredalei iredalei*: Rare) and Major Mitchell's Cockatoo (*Cacatua leadbeateri*: Rare), White-browed Treecreeper (*SPECIES NAME*, SA Rare) and an Australasian Shoveler (*species name,* SA Rare) (see Table 10-2 for known habitat requirements).
  - A further two fauna species were also considered as likely occurring within the CEA; Australian Bustard (*Ardeotis australis*: Vulnerable) and Elegant Parrot (*Neophema elegans*: Rare).
  - An additional two fauna species were considered possible to occur within the CEA; Peregrine Falcon (*Falco peregrinus:* Rare) and Grey Falcon (*Falco hypoleucos*: Rare) (see Appendix J for justification).
  - Five NPW listed fauna species are considered unlikely to occur within the CEA; Banded Stilt (*Cladorhynchus leucocephalus*: Vulnerable), Freckled Duck (*Stictonetta naevosa*: Vulnerable), Blue bonnet (western subspecies *Northiella haematogaster narethae:* Rare), Pied Oystercatcher (*Haematopus longirostris*: Rare) and Painted Finch (*Emblema pictum*: Rare) (see Appendix J for justification).

A summary of species of national or state conservation significance that have been observed during the EBCR and PER surveys include:

- Western Grasswren (Gawler Ranges *Amytornis textilis myall*, EPBC Vulnerable) at Site 1 and 5
- Gilbert's Whistler (*Pachycephala inornata*, SA Rare) at Site 2 and 4.
- Slender-billed Thornbill (*Acanthiza iredalei iredalei*, SA Rare) at Site 3
- Mitchell's Cockatoo (*Cacatua leadbeateri*: SA Rare) during PER.
- White-browed Treecreeper (*Climacteris affinis*, SA Rare) during PER.
- Australasian Shoveler (*Anas rhynchotis,* SA Rare) during PER.

- Sandalwood (*Santalum spicatum,* SA Vulnerable) opportunistically in both PER and EBCR.
- Flinders Ranges Wattle (*Acacia iteaphylla,* SA Rare) during PER.

11.5 Future Land Use Threats

The PER identified both positive and negative impacts on biodiversity values arising from pressures resulting from the development and operation of the CEA. **Table 10-4** provides an overview of key pressures and impacts to biodiversity that may arise as a result of Defence activity on the CEA. Construction and operation of facilities on the CEA with generally have a negative impact on the fauna and flora within the study region.

Jacobs (2015b) also outlines the threats to Heritage, Atmosphere, Land Condition, Biodiversity and Water through changed land use within the CEA.

11.6 Environmental Management Recommendations

Management responses to combat future land use threats are proposed across a number of Management Plans developed under the EMF, including the:

- Flora and Fauna Management Plan
- Feral Animal Management Plan
- Weed Management Plan
- Fire Management Plan
- Sustainability, Monitoring and Reporting Plan
- Land Rehabilitation and Degradation Management Plan.

Further onsite management will be achieved through the implementation of Range Standing Orders and directions communicated through site inductions, the environmental clearance certificate processes requiring assessment of environmental impacts prior to activities deemed likely to cause significant change, and the adoption of a 'rest and rotate' approach to use of training areas.

Further information regarding Defence management responses to the mitigation and management of the impacts arising from pressures facing heritage values, particularly Indigenous heritage, are identified and articulated in the Indigenous Heritage Management Plan (Jacobs 2015a).

There is currently no Historical Heritage Management Plan for the management or mitigation of impacts on historical heritage values.

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The potential presence of the EPBC PMST listed weed species was only supported by corresponding BDBSA records from the Proclamation Area for Ward's Weed (*Carrichtera annua*), African Boxthorn (*Lycium ferocissimum*) and Pricky Pears (*Cylindropuntia* sp. and *Opuntia* spp.). These species are known to exist in the greater Eyre Peninsula region (DEH 2001

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Appendix A. Fauna methodology

A total of six fauna sites were surveyed (sites 1-6). Sites were marked in the field with flagging tape at the nearest point along the access track and at the survey site to assist with relocation during the course of the survey. Due to presence of civilians on some of the sites, additional GPS tagging was used when flagging tape made the site a potential target for vandalism. Flagging was removed at the end of the survey. Site locations were recorded by GPS (GDA94: MGA 53). Habitat photographs of each survey site are provided in Appendix B.

Trapping (mammals and reptiles)

Pitfall lines and trap lines were established at each site and monitored continuously over a minimum of 4 nights and 4 days between the 17th and 22nd of November 2014. Sites 4, 5, and 6 were established on the 17th and ran for four nights until closed on the morning of the 21st of November. Sites 1, 2 and 3 were established on the 18th of November and ran for four nights until closed on the morning of the 22nd of November. All equipment and flagging tape was removed from each site at the end of the survey period, and the pit traps were removed, back filled and compacted to ground level. Leaf litter and fallen branches were moved over the backfilled trap-lines.

The layout of traps in each survey site involved:

- A drift fence line, approximately 60m x 0.3m, dug into the ground approximately 5-10cm depth with a minimum of five pitfall traps spaced evenly along the length. Funnel traps were also placed along each pit trap line as they are considered effective at capturing small reptiles. 1-2 pairs of funnel traps (one on each side of fence line) were placed along each line.
- 20 ('type A') Elliott traps, 10 on each side of the pit-line, placed within shade beneath low shrubs or fallen branches approximately 10m apart. The trap lines were generally placed extending outward diagonally from each side of the pit line. Elliot traps were baited with a ball of oats and peanut butter.
- 2 Cage traps were positioned at each fauna survey site, one at the end of each Elliot trap line. These were baited with sardines.

This trap layout is based on the *Guidelines for Vertebrate Surveys in South Australia* (Owens 2000). The pit traps consisted of poly-plastic sheets (extra deep 750mm x 600mm in sandy conditions considered suitable for Sandhill Dunnart, or Standard 500mm x 380mm in other habitats) rolled into a tube with a mesh base bound around one end. The deeper pits were utilised where possible to target marsupials with a more powerful jump (e.g. Sandhill Dunnart). All pits were dug into the ground to sit flush with the surface approximately every 8-10 metres along the drift-fence. Where possible, the pits were located within different microhabitats along the line. The pit traps remained in place over 4 nights, and were checked early each morning and rechecked during the afternoon (for nocturnal and diurnal captures respectively). Additional leaf litter and damp sponges were placed in the pitfalls early in the morning to provide shade and moisture for captured animals on days where high temperatures were forecast. The Elliott traps and cage traps also remained in place over 4 nights and were checked early each morning then closed for the day (to avoid daytime captures and heat stress). All traps were re-opened late each afternoon and rebaited if required.

Any trapped animals were bagged for identification back at base camp and released near the capture point at a later time, or euthanised and vouchered for the South Australian Museum. There was no need to mark captured animals in this instance because species diversity rather than abundance was being investigated.

Bird survey

Bird surveys were conducted at each fauna survey site on a minimum of two mornings and two afternoons. If weather conditions or timing were not considered optimal, repeat surveys were undertaken. A conscious effort to rotate field personnel between sites was made, given the documented 'observer bias' (Alldredge *et al*. 2006) which occurs during bird survey work (e.g. some observers are better at identifying inconspicuous birds by calls than others, some tend to focus on canopy birds, others on ground-level species). Bird surveys occurred during the early morning (beginning 0600 hours to approximately 0800 hours), with occasional additional surveys

conducted throughout the day if conditions were good. Each survey ran for a minimum of 30 minutes and recorded all species seen or heard (and identified), either using the site or flying over (e.g. raptors, if they were observed hunting overhead). Birds that were noted outside of the time of bird count, or outside the survey sites, were noted as opportunistic observations and recorded elsewhere (as was well as any records of mammals and reptiles).

Less common bird calls, or those which observers were unsure of, were confirmed using Michael Morcombe's eGuide to Birds of Australia, which includes bird calls, descriptions and distributions of species. This system was also used to confirm, or double-check, observations of any significant species that were recorded.

Active reptile, track and scat searches

Each site was also actively searched at least twice for reptiles, along with any indications of mammal, bird or reptile activity evidenced by tracks, scats and traces (e.g. burrows, diggings, shed skin, etc). Any reptiles noted during these searches were either identified in-field, or captured (where possible), bagged and identified back at base camp using taxonomic keys and magnifying aids. If search conditions were considered not optimal during any search (i.e. due to inclement weather conditions, or poor timing), additional searches were undertaken. Searches were undertaken for a minimum of 30 minutes and involved:

- turning rocks and logs, raking through leaf litter and grasses beneath trees, looking under bark, in crevices, in hollows
- recording the number of individuals of each species seen
- recording scats, tracks and other signs or traces where they could be confidently attributed to species (e.g. 'triangular' diggings within ant nests would be considered evidence of echidnas at the site, distinctive scats of foxes, tracks of dingos, Malleefowl mounds, lizard or snake skins).

Spotlighting and call play-back

Nocturnal searches were conducted at each site, which involved spotlighting and listening for nocturnal vertebrate species, as well as conducting call play-back routines. Searches were undertaken for a minimum of 30 minutes. Spotlighting was conducted using high-voltage spotlights with battery packs (Lightforce Walkabout Kit) and with head mounted LED torches. The high voltage spotlights were used to systematically scan tree canopies, trunks and branches and distant ground for any movement or 'eyeshine' from nocturnal mammals and birds. Head mounted torches were used to actively search more proximate areas for nocturnal reptiles (geckos), again using 'eyeshine' techniques, and actively searching fallen timber, tree trunks and beneath bark.

Call playback units were used to periodically play calls of targeted species (i.e. those known from the broader region and/or suspected from the project area) in an attempt to get individuals to respond and thus alert the survey team of their presence. In this instance, calls of the Southern Boobook Owl (*Ninox novaeseelandiae*), Tawny Frogmouth (*Podargus strigoides*), Spotted Nightjar (*Eurostopodus argus*), Australian Owlet Nightjar (*Aegotheles cristatus*) and Barn Owl (*Tyto javanica*) were played at each site.

Bat call recording

Bats were surveyed using ANABAT bat detectors, which were set up during late afternoons or early evenings to record bat vocalisations overnight at a central and appropriate location within survey sites. Calls were recorded at all sites. Vocalisations were assessed using Analook software, and species determined using vocalisation keys, knowledge and experience in the area. Bat data was confirmed by Dennis Matthews, SA local bat expert. Harp traps were not used.

Opportunistic observations

Opportunistic observations make up an important component of a fauna survey and constitute any observations made while travelling around the project area or between the survey sites. Any animals identified opportunistically, either via direct observation or by evidence, were recorded on data sheets with location and

any useful notes. These species were added to site species lists if identified at a survey site, or to a general survey species list if from the broader project area (if not attributed to a particular habitat type).

Active Malleefowl survey

Malleefowl (*Leipoa ocellata*) surveys were undertaken by conducting roaming searches of known habitat. Two observers equipped with binoculars and a GPS walked 70 metres apart through the mallee habitat and actively searched for evidence of malleefowl activity (including active and disused mounds). If located, a GPS point and photograph was taken as well a general description of the activity observed.

Identification

The following reference materials were used for species identification and classification:

Reptiles

- A Complete Guide to Reptiles of Australia 2nd edition (Wilson and Swan 2008)
- Reptiles and Amphibians of Australia (Cogger 2014)
- Key to the Geckos of South Australia (Hutchinson unpublished)
- Key to the Skinks of South Australia (Hutchinson unpublished)

Birds

- The Field Guide to the Birds of Australia, 7th edition (Pizzey and Knight 2006)
- Field Guide to the Birds of Australia, 7th edition (Simpson and Day 2004)
- eGuide to Australia Birds, application (Morcombe 2011)

Mammals

- A Field Guide to the Mammals of Australia (Menkhorst and Knight 2001)
- Mammals of Australia (Strahan 1995)
- Tracks, Scats and Other Traces (Triggs 1996)
- An Interim Guide to Identification of Insectivorous Bats of South-eastern Australia (Parnaby 1992)
- Bat calls of New South Wales (Pennay et al. 2004)
- Key to Dasyuridae of SA (Kemper unpublished)
- Key to Muridae of South Australia (Kemper unpublished)
- Australian Bats (Churchill 2008)
- Census of Vertebrates of SA updated 2013 (SA Museum online)

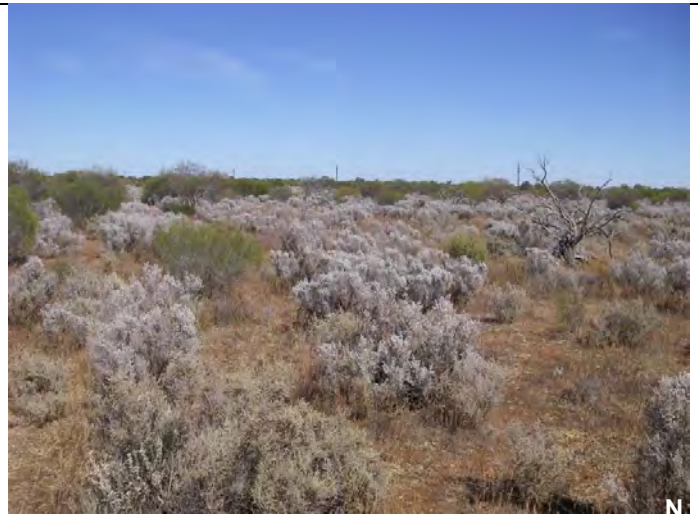
Appendix B. Photo reference points for the study sites

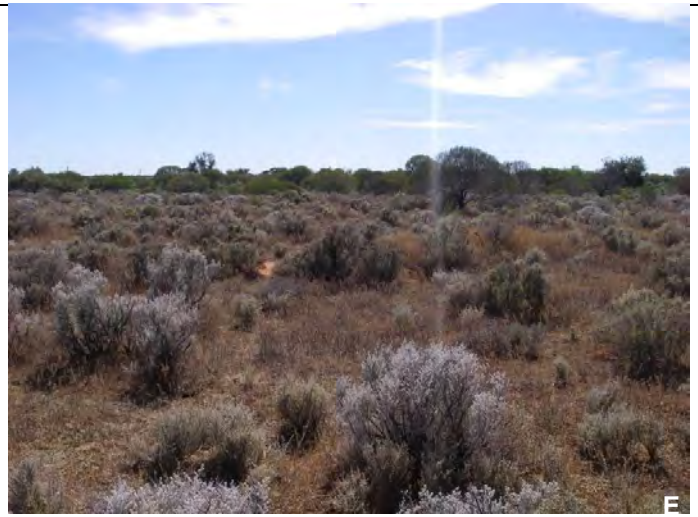
Flora and Fauna Site 1: Lignum (*Duma florulenta*) low-open shrubland swamp (53 H 738517 6370205)

Flora and Fauna Site 2: Black Oak (*Casuarina pauper*) open woodland over Chenopod low-open shrubland (53 H 734468 6379220)

Flora and Fauna Site 3: Red Mallee (*Eucalyptus oleosa*) / Yorrell (*E. gracilis*) open tree mallee (53 H 744093 6366828)

Flora and Fauna Site 4: Blackbush (*Maireana pyramidata*) / Pearl Bluebush (*Maireana sedifolia*) low open shrubland alluvial plain (53 H 719962 6352289)



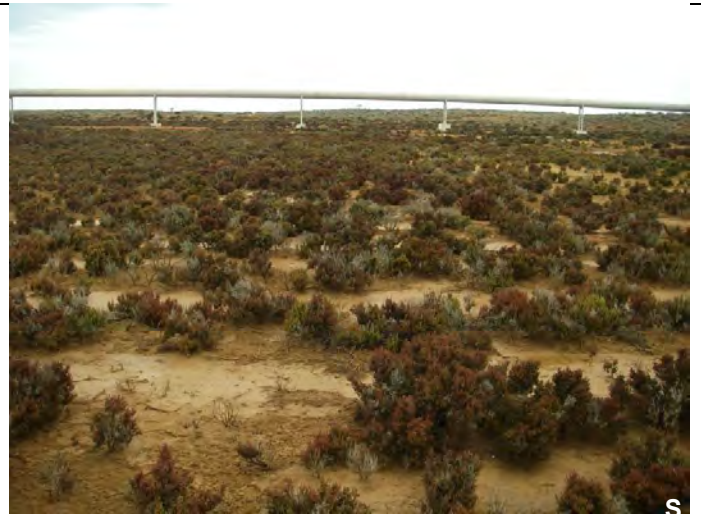


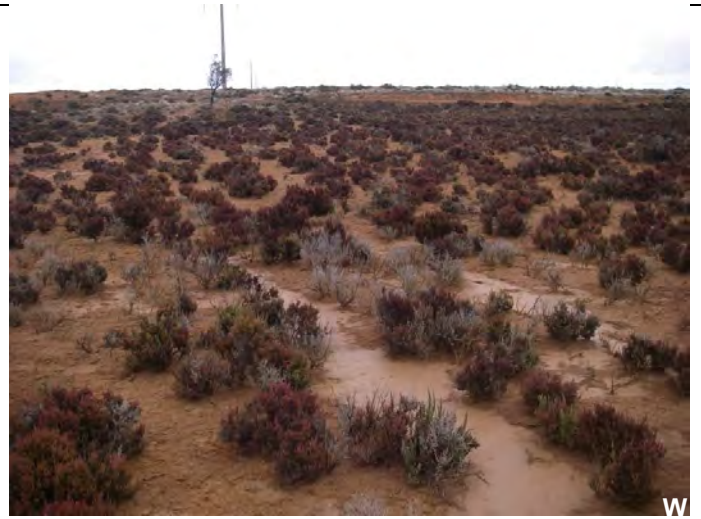
Flora and Fauna Site 5: Western Myall (*Acacia papyrocarpa)* low open woodland over mixed Chenopod low-open shrubland (53 H 723168 6358061)

Flora and Fauna Site 6: Bladder Saltbush (*Atriplex vesicaria*) / Blackbush (*Maireana pyramidata*) low open-shrubland alluvial plain (53 H 717546 6361724)

Flora Site A: Boree (*Melaleuca pauperiflora*) / Pearl Bluebush (*Maireana sedifolia*) open shrubland over Spinifex (*Triodia scariosa*) hummock grassland (53 H 739907 6381066)

Flora Site B: Black-seed Samphire (*Tecticornia pergranulata*) / *Slender Samphire (Tecticornia tenuis)* low open shrubland coastal saltmarsh (53 H 701061 6351502)

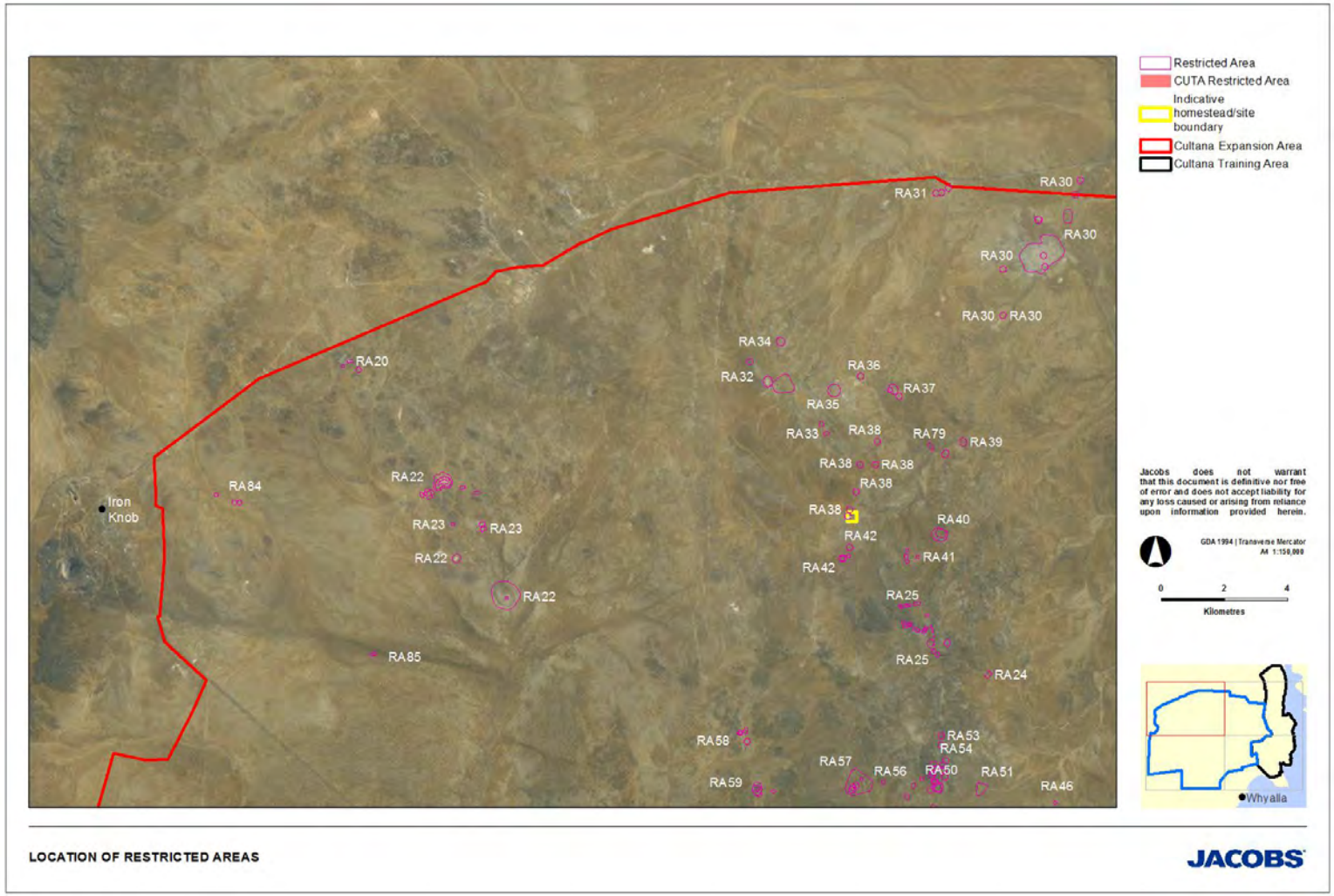




Flora Site C: Red Mallee (*Eucalyptus oleosa*) / Yorrell (*Eucalyptus gracilis*) open tree mallee (53 H 746673 6354938)

JACOBS

Appendix C. Cultural Significant Sites



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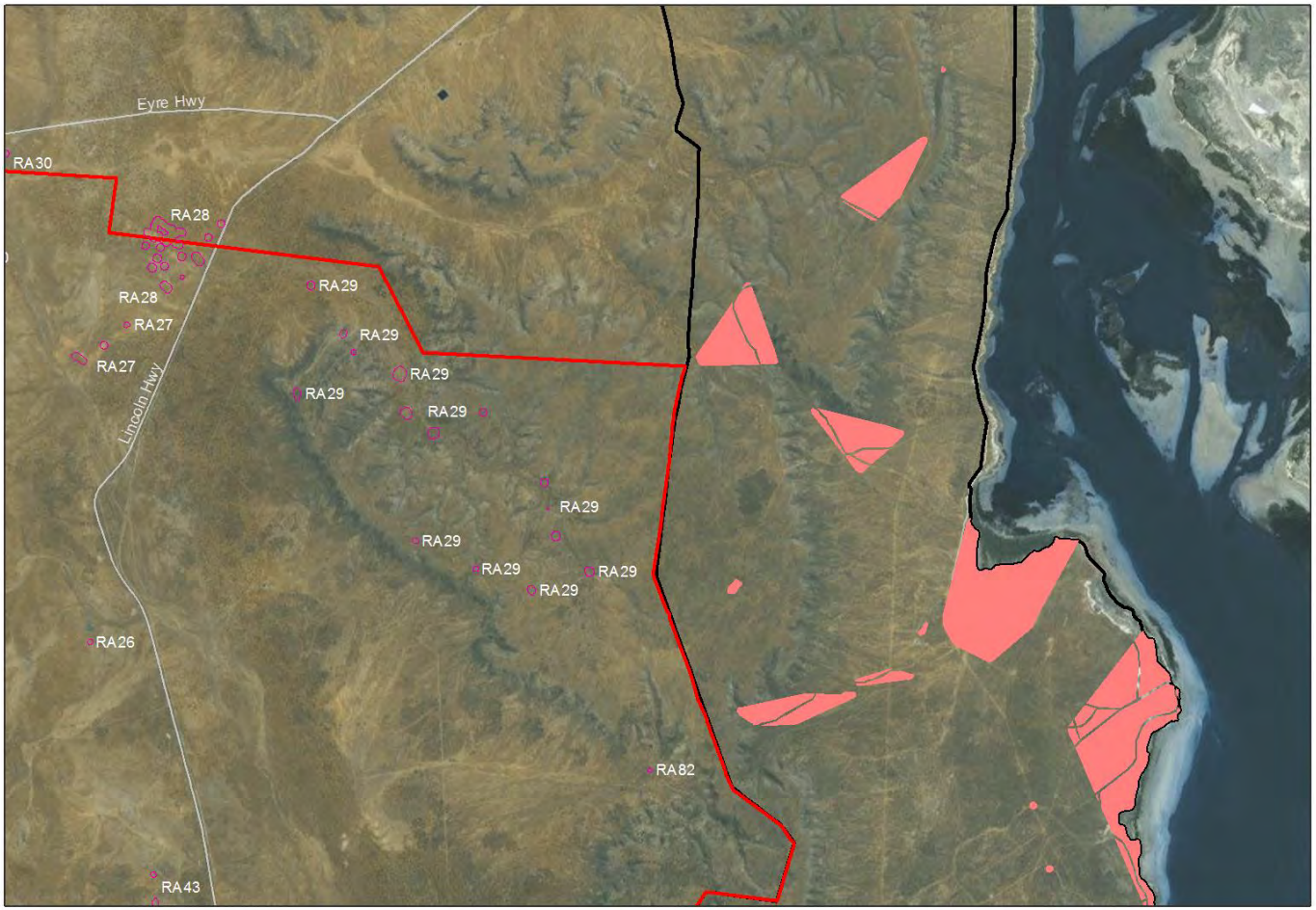


Restricted Area
CUTA Restricted Area
Indicative homestead/site boundary
Cultana Expansion Area
Cultana Training Area

Jacobs does not warrant that this document is definitive nor free of error and does not accept liability for any loss caused or arising from reliance upon information provided herein.

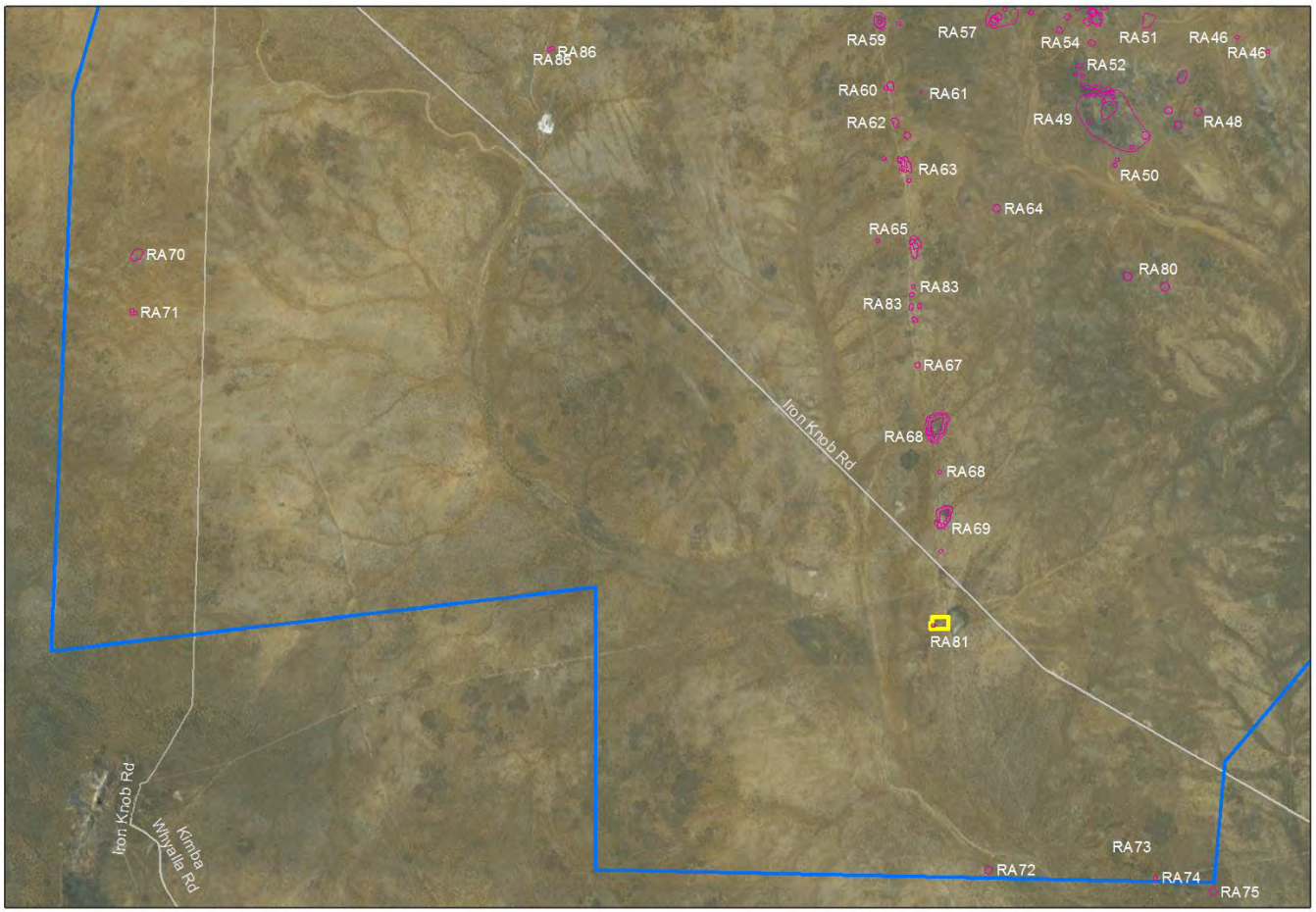
GDA 1994 | Transverse Mercator
A4 1:150,000

0 2 4
Kilometres

LOCATION OF RESTRICTED AREAS

JACOBS

JACOBS



Restricted Area
CUTA Restricted Area
Indicative homestead/site boundary
Cultana Expansion Area
Cultana Training Area

GDA 1994 | Transverse Mercator
A4 1:150,000

0 2 4
Kilometres

LOCATION OF RESTRICTED AREAS

JACOBS

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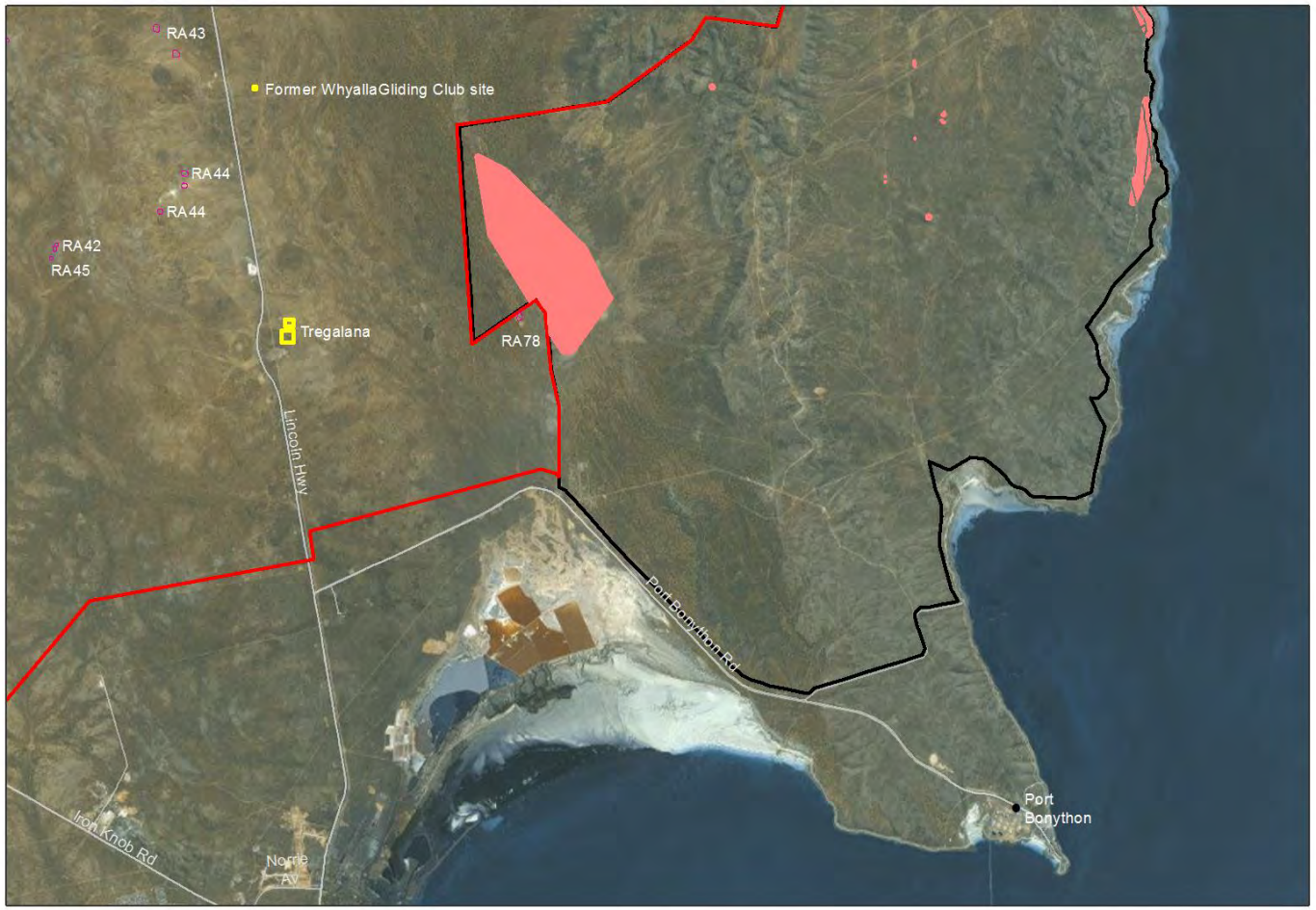

Indicative homestead/site boundary

Restricted Area

CUTA Restricted Area

Cultana Expansion Area

Cultana Training Area

GDA 1994 | Transverse Mercator
A4 1:150,000

0 2 4
Kilometres

LOCATION OF RESTRICTED AREAS

JACOBS

Middleback Station Historical Heritage Site Photographs

Plate 2 Main Homestead, Middleback Station

Plate 3 Quarters, Middleback Station

Plate 4 Brick lined septic well

Plate 5 Storage shed, laundry and cool room

Middleback Station Historical Heritage Site Photographs

Plate 6 Sheep dip and yards west of woolshed

Plate 7 Interior of woolshed shearing area

Plate 8 Drying shed/Crutching

Plate 9 Historic stockyard fences and quarters

Middleback Station Historical Heritage Site Photographs

Plate 10 Memorial/gravesite at Middleback Station

Plate 11 Artefact scatter west of shearer's quarters

Plate 12 Representative surface artefacts

Plate 13 Shearer's quarters, pump shed and shower block

Tregalana Station Historical Heritage Site Photographs

Plate 14 Extension at northern end of main homestead

Plate 15 Lubricant shed

Plate 16 Workshop and vehicle storage sheds

Plate 17 Main and side entrance to homestead

Tregalana Station Historical Heritage Site Photographs

Plate 18 Pet cemetery

Plate 19 Pet cemetery

Plate 20 Shearer's quarters and cool room

Plate 21 Roopena woolshed

Tregalana Station Historical Heritage Site Photographs

Plate 22 Main homestead entrance

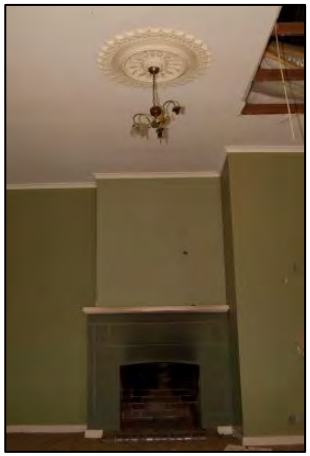

Plate 23 Living room fireplace and ceiling detail

Plate 24 Interior of Tregalana woolshed

Plate 25 Interior of Tregalana woolshed

Former Whyalla Gliding Club Historical Heritage Site Photographs

Plate 26 Overview of Whyalla Gliding Club Hangar

Plate 27 View west of Former Whyalla Gliding Clubhouse

Plate 28 View west to internal western wall of hangar

Plate 29 Whyalla Gliding Club Hangar (construction detail)

Roopena Station Historical Heritage Site Photographs

Plate 30 View north to main homestead and Roopena/Tank Hill

Plate 31 Robert Lange Cottage

Plate 32 1950s Main homestead

Plate 33 Slaughterhouse

Roopena Station Historical Heritage Site Photographs

Plate 34 Early stone fireplace/oven

Plate 35 Former school room

Plate 36 Stone fireplace/oven of second homestead

Plate 37 Living room of main homestead

Appendix D. Photographic plates of clay pans and highly erodible or saline soils

Plate 1: Clay pan approx. 12.5 km south of Roopena Homestead (12 km north of Middleback Homestead)

Plate 2: Clay pan approx. 1.2 km WSW of Wartaka Rd and Eyre Hwy intersection

Plate 3: Clay pan approximately 7 km NNE of Roopena Homestead

Plate 4: Clay pan approximately 2 km WSW of Pandurra Homestead

Plate 5: Clay pan approximately 9.5 km SSW of Wartaka Rd and Eyre Hwy intersection

Plate 6: View over unnamed salt lake approx. 4 km SE of Pandurra Homestead (dry at time of photograph, February 2015)

Plate 7: Samphire present within the unnamed salt lake

Plate 8: Area of highly erodible soil (silt) immediately SW of unnamed salt lake

Plate 9: Close up of highly erodible silt near unnamed salt lake

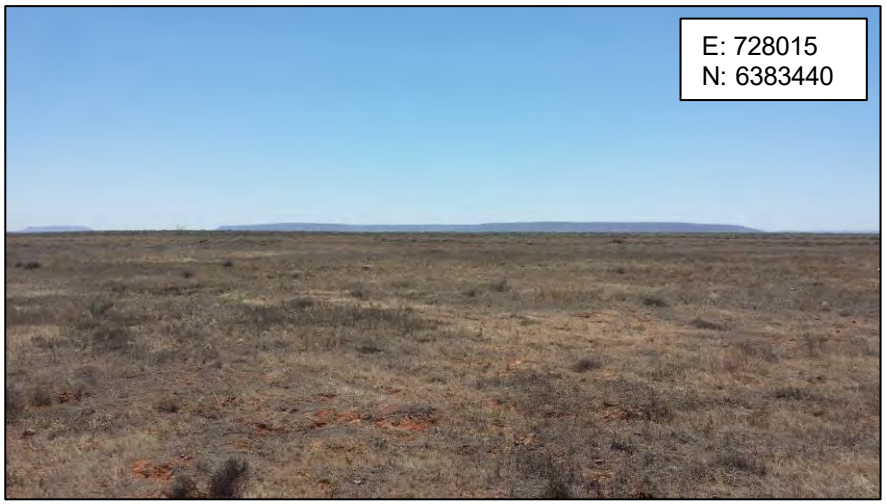

Plate 10: Area of highly erodible (fractured) soil near clay pan approximately 7.5 km NNE of Roopena Homestead

Plate 11: Close up of fractured soil approximately 7.5 km NNE of Roopena Homestead

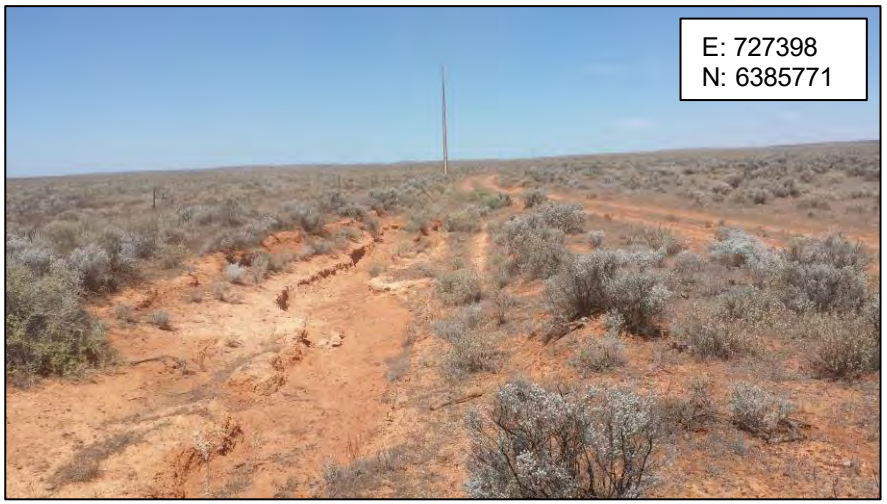

Plate 12: Gully erosion observed adjacent to vehicle track from Roopena Homestead to Eyre Hwy (approx. 1.6 km SSW of Pandurra Homestead)

E: 711670
N: 6364625

Plate 13: Highly erodible soils (sand) in ephemeral watercourse near Iron Knob to Whyalla Rd (approx. 1.5 km WSW of 23 Mile Quartz Quarry)

E: 711670
N: 6364625

Plate 14: Gully erosion adjacent to ephemeral watercourse noted in Plate 11

Appendix E. Photographic Plates of Contaminated Sites Observations

E.1 Roopena Homestead Contaminated Site Photographs

Plate 1: Oil and fuel storage shed near Main Homestead with adjacent UST

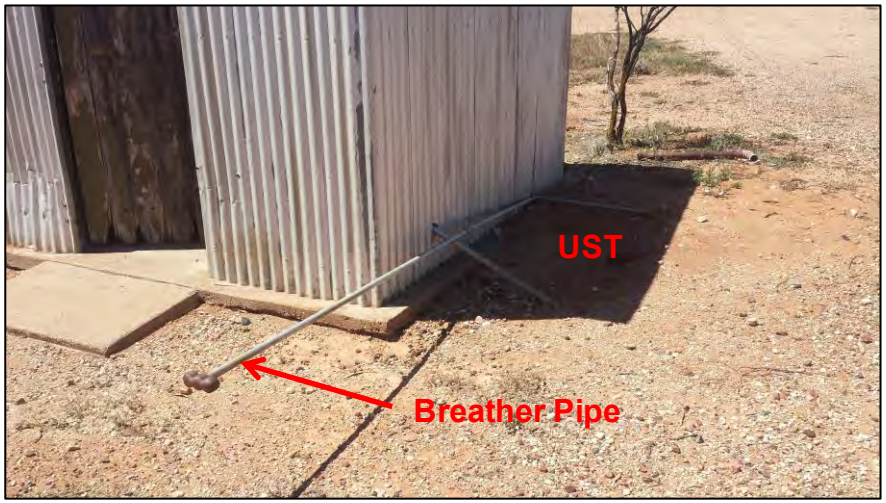

Plate 2: Breather pipe from UST adjacent to shed

Plate 3: UST fill point, breather pipe line and fuel transmission line

Plate 4: Internal depth of UST (approx. 1.2 m)

Plate 5: Fuel transmission line to inside of oil and fuel storage shed

Plate 6: Staining on concrete floor of oil and fuel storage shed

Plate 7: Labels indicating historical oil storage inside oil and fuel storage shed

Plate 8: Surface staining at rear of oil and fuel storage shed beneath location of former diesel AST

Plate 9: Vehicle service pit inside workshop near Main Homestead

Plate 10A and 10B: View inside vehicle service pit

Plate 11: AST at the rear of the workshop

Plate 12: View of breather pipe on top of AST

Plate 13: Incineration activities on bare earth

E.2 Middleback Homestead Contaminated Site Photographs

Plate 1: UST at rear of oil and fuel storage shed near original Homestead

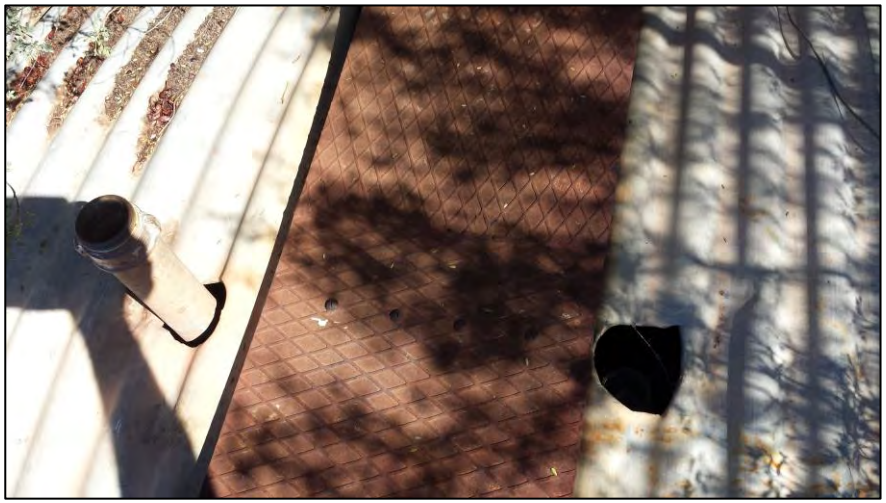

Plate 2: Top of UST showing fill point and dip point

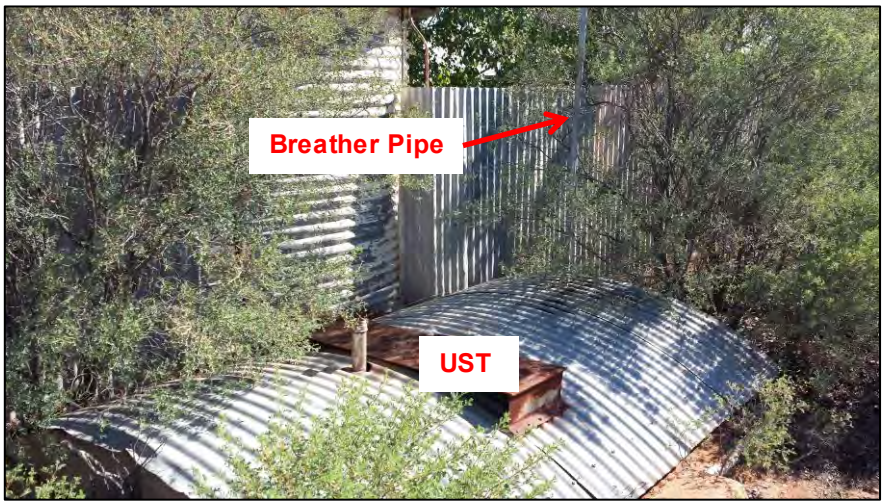

Plate 3: UST breather pipe

Plate 4: Internal depth of UST (approx. 2 m)

Plate 5: Fuel transmission line to inside of oil and fuel storage shed

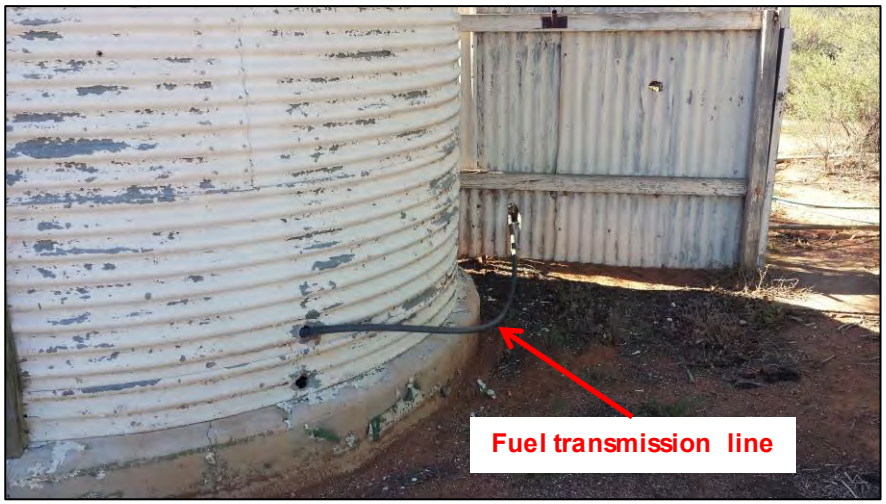

Plate 6: Fuel transmission line to inside of oil and fuel storage shed

Plate 7: Oil and fuel storage shed

Plate 8: Heavy staining of concrete floor inside oil and fuel storage shed with hydrocarbon odour

Plate 9: Oil / fuel storage drums inside oil and fuel storage shed

Plate 10: Second oil storage shed near vehicle service pit and waste oil soakage pit, near original Homestead

Plate 11A and 11B: View inside vehicle service pit adacent to second oil storage shed

Plate 12: Waste oil soakage pit adjacent to second oil storage shed

Plate 13: Close up view of waste oil soakage pit

Plate 14: View of waste oil seepage awqay from pit toward nearby vegetation

Plate 15: Former blacksmith workshop (approx. 280 m ESE from Original Homestead)

Plate 16: Old furnace inside blacksmith workshop

Plate 17: Animal carcasses inside concrete and steel structure (approx. 300 m NE of original HS)

Plate 18: View back toward stock sheds from disposed animal carcass

Plate 19: Storage tank of unknown use adjacent to shearing shed

Plate 20: View inside storage tank of unknown use

Plate 21: Interceptor pit adjacent to Middelback Homestead near main kitchen

Plate 22: View inside interceptor pit

Plate 23: Evidence of historical incineration activities

Plate 24: Scrap motor with surface soil staining adjacent

Plate 25: Private waste dumping approximately 550m SE of Original Homestead

Plate 26: Private waste dumping approximately SE of Original Homestead

E.3 Tregalana Homestead Contaminated Site Photographs

Plate 1: Oil and fuel storage shed near Main Homestead with adjacent UST and former bowser (approx. 100 m WSW of HS)

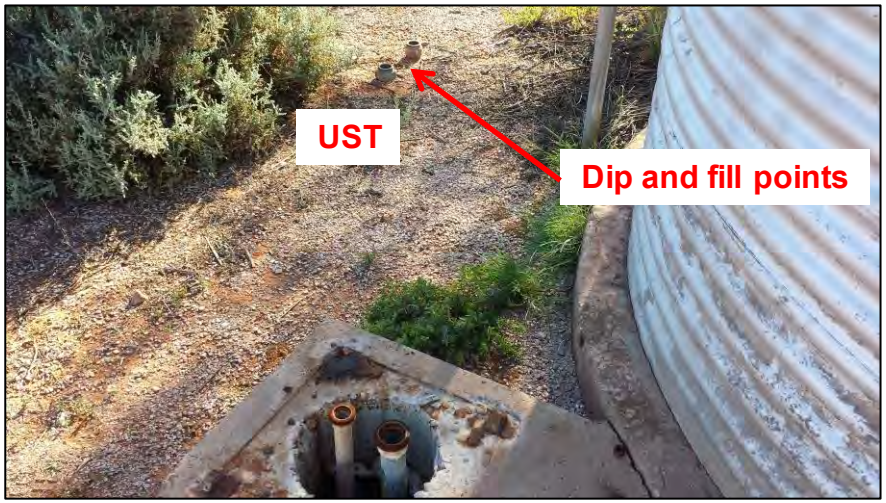

Plate 2: Base of bowser with UST in the background

Plate 3: UST fill point and dip point

Plate 4: Internal depth of UST (approx. 1.8 m)

Plate 5: View inside oil and fuel storage shed; staining on concrete floor

Plate 6: Concrete plaque on base of oil and fuel storage shed potentially indicating year of construction (1952)

Plate 7A and 7B: View inside vehicle service pit adacent to oil and fuel storage shed (staining in base)

Plate 8: Old fuel hose outside vehicle storage shed near oil and fuel storage shed

Plate 9: Small domestic incinerator near Manager's House

E.4 Former Whyalla Gliding Club Contaminated Site Photographs

Plate 1: Chemical storage drums at rear of sheds and hangar

Plate 2: Evidence of surface soil staining around base of drums

Plate 3: Surface soil staining at base of drum

Plate 4: Label indicating Turpentine Substitute contents in drum

Appendix F. BDBSA Records for 5km buffer of CEA

F1: BDBSA Records for Flora within 5km of the CEA

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Santalum spicatum	Sandalwood	Native		V
Centrolepis cephaloformis ssp. cephaloformis	Cushion Centrolepis	Native		R
Crassula exserta	Large-fruit Crassula	Native		R
Rumex dumosus	Wiry Dock	Native		R
Brachyscome muelleri	Corunna Daisy	Native	EN	E
Abutilon otocarpum	Desert Lantern-bush	Native		
Acacia ancistrophylla var. lissophylla	Hook-leaf Wattle	Native		
Acacia aneura var. (NC)	Mulga	Native		
Acacia brachystachya	Turpentine Mulga	Native		
Acacia burkittii	Pin-bush Wattle	Native		
Acacia calamifolia (NC)	Wallowa	Native		
Acacia continua	Thorn Wattle	Native		
Acacia ligulata	Umbrella Bush	Native		
Acacia notabilis	Notable Wattle	Native		
Acacia oswaldii	Umbrella Wattle	Native		
Acacia papyrocarpa	Western Myall	Native		
Acacia sibirica	Bastard Mulga	Native		
Acacia tetragonophylla	Dead Finish	Native		
Acacia victoriae ssp. victoriae	Elegant Wattle	Native		
Acarospora smaragdula		Native		
Actinobole uliginosum	Flannel Cudweed	Native		
Alectryon oleifolius ssp. canescens	Bullock Bush	Native		
Allocasuarina verticillata	Drooping Sheoak	Native		
Alyogyne hakeifolia	Hakea-leaf Hibiscus	Native		
Amyema miquelii	Box Mistletoe	Native		
Amyema miraculosa ssp. boormanii	Fleshy Mistletoe	Native		
Amyema quandang var. quandang	Grey Mistletoe	Native		
Angianthus glabratus	Smooth Angianthus	Native		
Apium prostratum var. filiforme	Native Celery	Native		
Arabidella filifolia	Thread-leaf Cress	Native		
Arabidella nasturtium	Yellow Cress	Native		
Arabidella trisecta	Shrubby Cress	Native		
Aristida contorta	Curly Wire-grass	Native		
Arthropodium minus	Small Vanilla-lily	Native		
Arthropodium strictum	Common Vanilla-lily	Native		
Asperula conferta	Common Woodruff	Native		
Atriplex acutibractea ssp. acutibractea	Pointed Saltbush	Native		
Atriplex angulata	Fan Saltbush	Native		
Atriplex eardleyae	Eardley's Saltbush	Native		

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Atriplex holocarpa	Pop Saltbush	Native		
Atriplex stipitata	Bitter Saltbush	Native		
Atriplex vesicaria	Bladder Saltbush	Native		
Atriplex vesicaria ssp. (NC)	Bladder Saltbush	Native		
Austrostipa acrociliata	Graceful Spear-grass	Native		
Austrostipa drummondii	Cottony Spear-grass	Native		
Austrostipa elegantissima	Feather Spear-grass	Native		
Austrostipa eremophila	Rusty Spear-grass	Native		
Austrostipa exilis	Heath Spear-grass	Native		
Austrostipa mollis	Soft Spear-grass	Native		
Austrostipa nitida	Balcarra Spear-grass	Native		
Austrostipa nodosa	Tall Spear-grass	Native		
Austrostipa platychaeta	Flat-awn Spear-grass	Native		
Austrostipa scabra ssp. scabra	Rough Spear-grass	Native		
Austrostipa sp.	Spear-grass	Native		
Austrostipa trichophylla	Spear-grass no common name	Native		
Baumea juncea	Bare Twig-rush	Native		
Beyeria lechenaultii	Pale Turpentine Bush	Native		
Beyeria opaca	Dark Turpentine Bush	Native		
Bolboschoenus caldwellii	Salt Club-rush	Native		
Brachyscome ciliaris var. ciliaris	Variable Daisy	Native		
Brachyscome dichromosomatica var. dichromosomatica	Large Hard-head Daisy	Native		
Brachyscome lineariloba	Hard-head Daisy	Native		
Brachyscome perpusilla	Tiny Daisy	Native		
Bromus arenarius	Sand Brome	Native		
Bulbine semibarbata	Small Leek-lily	Native		
Bursaria spinosa ssp. spinosa	Sweet Bursaria	Native		
Caladenia capillata	Wispy Spider-orchid	Native		
Caladenia toxochila	Bow-lip Spider-orchid	Native		
Calandrinia calyptrata	Pink Purslane	Native		
Calandrinia eremaea	Dryland Purslane	Native		
Callitris glaucophylla	White Cypress-pine	Native		
Calotis cymbacantha	Showy Burr-daisy	Native		
Calotis hispidula	Hairy Burr-daisy	Native		
Carpobrotus rossii (NC)	Native Pigface	Native		
Cassinia laevis	Curry Bush	Native		
Cassytha peninsularis	Peninsula Dodder-laurel	Native		
Casuarina pauper	Black Oak	Native		
Centipeda thespidioides	Desert Sneezeweed	Native		
Centrolepis eremica	Dryland Centrolepis	Native		
Centrolepis polygyna	Wiry Centrolepis	Native		
Centrolepis strigosa ssp. strigosa	Hairy Centrolepis	Native		

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Chamaesyce drummondii (NC)	Caustic Weed	Native		
Cheilanthes distans	Bristly Cloak-fern	Native		
Cheilanthes lasiophylla	Woolly Cloak-fern	Native		
Cheilanthes sieberi ssp. sieberi	Narrow Rock-fern	Native		
Chenopodium curvispicatum	Cottony Goosefoot	Native		
Chenopodium desertorum ssp.	Desert Goosefoot	Native		
Chenopodium desertorum ssp. anidiophyllum	Mallee Goosefoot	Native		
Chenopodium desertorum ssp. desertorum	Frosted Goosefoot	Native		
Chenopodium gaudichaudianum	Scrambling Goosefoot	Native		
Chenopodium nitrariaceum	Nitre Goosefoot	Native		
Chondropsis semiviridis	Lichen spp.	Native		
Chrysocephalum apiculatum	Common Everlasting	Native		
Chrysocephalum semipapposum	Clustered Everlasting	Native		
Chthonocephalus pseudevax	Ground-heads	Native		
Cladia aggregata	Lichen spp.	Native		
Codonocarpus cotinifolius	Desert Poplar	Native		
Commersonia tatei	Trailing Commersonia	Native		
Convolvulus remotus	Grassy Bindweed	Native		
Crassula closiana	Stalked Crassula	Native		
Crassula colorata var. acuminata	Dense Crassula	Native		
Crassula colorata var. colorata	Dense Crassula	Native		
Crassula sieberiana ssp. tetramera (NC)	Australian Stonecrop	Native		
Cratystylis conocephala	Bluebush Daisy	Native		
Cryptandra sp. Floriferous (W.R.Barker 4131)	Pretty Cryptandra	Native		
Cyperus alterniflorus	Umbrella Flat-sedge	Native		
Cyperus gymnocaulos	Spiny Flat-sedge	Native		
Cyphanthera myosotidea	Small-leaf Ray-flower	Native		
Dampiera rosmarinifolia	Rosemary Dampiera	Native		
Danthonia sp. (NC)	Wallaby-grass	Native		
Daucus glochidiatus	Native Carrot	Native		
Dianella revoluta var. divaricata	Broad-leaf Flax-lily	Native		
Dianella revoluta var. revoluta	Black-anther Flax-lily	Native		
Dicrastylis verticillata	Whorled Sand-sage	Native		
Diploschistes ocellatus	Crater Lichen spp.	Native		
Diploschistes scruposus	Crater Lichen spp.	Native		
Dissocarpus biflorus var. biflorus	Two-horn Saltbush	Native		
Dissocarpus paradoxus	Ball Bindyi	Native		
Dodonaea baueri	Crinkled Hop-bush	Native		
Dodonaea intricata	Gawler Ranges Hop-bush	Native		
Dodonaea lobulata	Lobed-leaf Hop-bush	Native		
Dodonaea viscosa ssp. angustissima	Narrow-leaf Hop-bush	Native		
Dysphania cristata	Crested Crumbweed	Native		
Dysphania melanocarpa f. melanocarpa (NC)	Black-fruit Goosefoot	Native		

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Einadia nutans ssp. nutans	Climbing Saltbush	Native		
Elachanthus pusillus	Elachanth	Native		
Enchylaena tomentosa var.	Ruby Saltbush	Native		
Enchylaena tomentosa var. tomentosa	Ruby Saltbush	Native		
Enneapogon avenaceus	Common Bottle-washers	Native		
Enneapogon nigricans	Black-head Grass	Native		
Enteropogon acicularis	Umbrella Grass	Native		
Epilobium hirtigerum	Hairy Willow-herb	Native		
Eremophila alternifolia	Narrow-leaf Emubush	Native		
Eremophila behriana	Rough Emubush	Native		
Eremophila deserti	Turkey-bush	Native		
Eremophila duttonii	Harlequin Emubush	Native		
Eremophila glabra ssp. glabra	Tar Bush	Native		
Eremophila latrobei ssp. glabra	Crimson Emubush	Native		
Eremophila longifolia	Weeping Emubush	Native		
Eremophila oppositifolia ssp. oppositifolia	Opposite-leaved Emubush	Native		
Eremophila scoparia	Broom Emubush	Native		
Eremophila serrulata	Green Emubush	Native		
Eriochiton sclerolaenoides	Woolly-fruit Bluebush	Native		
Eriochlamys behrii	Woolly Mantle	Native		
Erodiophyllum elderi	Koonamore Daisy	Native		
Erodium crinitum	Blue Heron's-bill	Native		
Erodium janszii	Clammy Heron's-bill	Native		
Eucalyptus brachycalyx	Gilja	Native		
Eucalyptus calcareana	Nundroo Mallee	Native		
Eucalyptus camaldulensis ssp.	River Red Gum	Native		
Eucalyptus concinna	Victoria Desert Mallee	Native		
Eucalyptus gracilis	Yorrell	Native		
Eucalyptus intertexta	Gum-barked Coolibah	Native		
Eucalyptus leptophylla	Narrow-leaf Red Mallee	Native		
Eucalyptus oleosa ssp. ampliata	Red Mallee	Native		
Eucalyptus porosa	Mallee Box	Native		
Eucalyptus socialis ssp. socialis	Beaked Red Mallee	Native		
Euchiton sphaericus	Annual Cudweed	Native		
Euphorbia tannensis ssp. eremophila	Desert Spurge	Native		
Eutaxia microphylla	Common Eutaxia	Native		
Exocarpos aphyllus	Leafless Cherry	Native		
Frankenia crispa	Hoary Sea-heath	Native		
Frankenia pauciflora var. gunnii	Southern Sea-heath	Native		
Frankenia serpyllifolia	Thyme Sea-heath	Native		
Fulgensia bracteata	Tundra Sulphur Lichen	Native		
Galium leptogonium	Reflexed Bedstraw	Native		
Geijera linearifolia	Sheep Bush	Native		

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Geococcus pusillus	Earth Cress	Native		
Geranium retrorsum	Grassland Geranium	Native		
Glischrocaryon flavescens	Yellow Pennants	Native		
Glycine rubiginosa	Twining Glycine	Native		
Gnephosis arachnoidea	Spidery Button-flower	Native		
Gonocarpus elatus	Hill Raspwort	Native		
Goodenia calcarata	Streaked Goodenia	Native		
Goodenia pinnatifida	Cut-leaf Goodenia	Native		
Goodenia pusilliflora	Small-flower Goodenia	Native		
Goodenia willisiana	Silver Goodenia	Native		
Gossypium sturtianum var. sturtianum	Sturt's Desert Rose	Native		
Grevillea huegelii	Comb Grevillea	Native		
Grevillea nematophylla ssp. nematophylla	Water Bush	Native		
Grevillea pterosperma	Dune Grevillea	Native		
Gunniopsis quadrifida	Sturt's Pigface	Native		
Hakea francisiana	Bottlebrush Hakea	Native		
Halgania andromedifolia	Scented Blue-flower	Native		
Halosarcia sp. (NC)	Samphire	Native		
Hibiscus krichauffianus	Velvet-leaf Hibiscus	Native		
Hyalosperma semisterile	Orange Sunray	Native		
Hybanthus floribundus ssp. floribundus	Shrub Violet	Native		
Hydrocotyle trachycarpa	Wild Parsley	Native		
Indigofera australis ssp. hesperia	Austral Indigo	Native		
Isoetopsis graminifolia	Grass Cushion	Native		
Isotoma petraea	Rock Isotome	Native		
Juncus bufonius	Toad Rush	Native		
Lachnagrostis filiformis	Common Blown-grass	Native		
Lasiopetalum discolor	Coast Velvet-bush	Native		
Lawrencia glomerata	Clustered Lawrencia	Native		
Leiocarpa semicalva ssp. semicalva	Scented Button-bush	Native		
Leiocarpa websteri	Narrow Plover-daisy	Native		
Lemooria burkittii	Wires-and-wool	Native		
Lepidium papillosum	Warty Peppercress	Native		
Lepidium phlebopetalum	Veined Peppercress	Native		
Lepidosperma viscidum	Sticky Sword-sedge	Native		
Lotus cruentus	Red-flower Lotus	Native		
Lycium australe	Australian Boxthorn	Native		
Lysiana exocarpi ssp. exocarpi	Harlequin Mistletoe	Native		
Maireana aphylla	Cotton-bush	Native		
Maireana appressa	Pale-fruit Bluebush	Native		
Maireana astrotricha	Low Bluebush	Native		
Maireana brevifolia	Short-leaf Bluebush	Native		
Maireana erioclada	Rosy Bluebush	Native		

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Maireana georgei	Satiny Bluebush	Native		
Maireana integra	Entire-wing Bluebush	Native		
Maireana pentatropis	Erect Mallee Bluebush	Native		
Maireana pyramidata	Black Bluebush	Native		
Maireana radiata	Radiate Bluebush	Native		
Maireana schistocarpa	Split-fruit Bluebush	Native		
Maireana sedifolia	Bluebush	Native		
Maireana trichoptera	Hairy-fruit Bluebush	Native		
Maireana triptera	Three-wing Bluebush	Native		
Maireana turbinata	Top-fruit Bluebush	Native		
Malacocera tricornis	Goat-head Soft-horns	Native		
Malva preissiana	Australian Hollyhock	Native		
Marsilea drummondii	Common Nardoo	Native		
Melaleuca brevifolia	Short-leaf Honey-myrtle	Native		
Melaleuca lanceolata	Dryland Tea-tree	Native		
Microseris lanceolata	Yam Daisy	Native		
Millotia perpusilla	Tiny Bow-flower	Native		
Minuria cunninghamii	Bush Minuria	Native		
Moss sp.		Native		
Myoporum platycarpum ssp. platycarpum	False Sandalwood	Native		
Myriophyllum verrucosum	Red Milfoil	Native		
Nicotiana goodspeedii	Small-flower Tobacco	Native		
Nicotiana sp. Corunna (D.E.Symon 17088)		Native		
Nicotiana velutina	Velvet Tobacco	Native		
Nitraria billardierei	Nitre-bush	Native		
Olearia calcarea	Crinkle-leaf Daisy-bush	Native		
Olearia decurrens	Winged Daisy-bush	Native		
Olearia floribunda	Heath Daisy-bush	Native		
Olearia muelleri	Mueller's Daisy-bush	Native		
Olearia pimeleoides	Pimelea Daisy-bush	Native		
Omphalolappula concava	Burr Stickseed	Native		
Osteocarpum acropterum var. acropterum	Tuberculate Bonefruit	Native		
Oxalis perennans	Native Sorrel	Native		
Parietaria cardiostegia	Mallee Smooth-nettle	Native		
Philotheca linearis	Narrow-leaf Wax-flower	Native		
Pimelea imbricata var. petraea	Rock Woolly Riceflower	Native		
Pimelea micrantha	Silky Riceflower	Native		
Pimelea microcephala ssp. microcephala	Shrubby Riceflower	Native		
Pimelea simplex ssp. continua	Desert Riceflower	Native		
Pimelea simplex ssp. simplex	Desert Riceflower	Native		
Pittosporum angustifolium	Native Apricot	Native		
Plagiobothrys plurisepaleus	White Rochelia	Native		
Plantago drummondii	Dark Plantain	Native		

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Plantago hispida	Hairy Plantain	Native		
Pleurosorus rutifolius	Blanket Fern	Native		
Poa poiformis var. poiformis	Coast Tussock-grass	Native		
Podolepis canescens	Grey Copper-wire Daisy	Native		
Podolepis capillaris	Wiry Podolepis	Native		
Pomax umbellata	Pomax	Native		
Prostanthera striatiflora	Striated Mintbush	Native		
Pterostylis biseta	Two-bristle Greenhood	Native		
Pterostylis excelsa	Dryland Greenhood	Native		
Pterostylis nana	Dwarf Greenhood	Native		
Ptilotus obovatus	Silver Mulla Mulla	Native		
Ptilotus seminudus	Rabbit-tails	Native		
Ranunculus hamatosetosus	Hill Buttercup	Native		
Ranunculus pentandrus var. platycarpus	Smooth Buttercup	Native		
Ranunculus sessiliflorus var. sessiliflorus	Annual Buttercup	Native		
Rhagodia crassifolia	Fleshy Saltbush	Native		
Rhagodia parabolica	Mealy Saltbush	Native		
Rhagodia spinescens	Spiny Saltbush	Native		
Rhagodia ulicina	Intricate Saltbush	Native		
Rhodanthe corymbiflora	Paper Everlasting	Native		
Rhodanthe laevis	Smooth Daisy	Native		
Rhodanthe microglossa	Clustered Everlasting	Native		
Rhodanthe moschata	Musk Daisy	Native		
Rhodanthe polygalifolia	Milkwort Everlasting	Native		
Rhodanthe pygmaea	Pigmy Daisy	Native		
Rhodanthe stricta	Slender Everlasting	Native		
Rhodanthe stuartiana	Clay Everlasting	Native		
Riccia limbata	Liverwort spp.	Native		
Rumex brownii	Slender Dock	Native		
Rumex tenax	Shiny Dock	Native		
Rytidosperma caespitosum	Common Wallaby-grass	Native		
Salsola australis	Buckbush	Native		
Santalum acuminatum	Quandong	Native		
Scaevola collaris	Fanflower spp.	Native		
Scaevola spinescens	Spiny Fanflower	Native		
Scambopus curvipes	No common name (Brassica family)	Native		
Schenkia australis	Spike Centaury	Native		
Schoenia ramosissima	Dainty Everlasting	Native		
Schoenoplectus pungens	Spiky Club-rush	Native		
Sclerolaena brachyptera	Short-wing Bindyi	Native		
Sclerolaena diacantha	Grey Bindyi	Native		
Sclerolaena divaricata	Tangled Bindyi	Native		
Sclerolaena eriacantha	Silky Bindyi	Native		

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Sclerolaena intricata	Tangled Bindyi	Native		
Sclerolaena lanicuspis	Spinach Bindyi	Native		
Sclerolaena obliquicuspis	Oblique-spined Bindyi	Native		
Sclerolaena patenticuspis	Spear-fruit Bindyi	Native		
Sclerolaena uniflora	Small-spine Bindyi	Native		
Sclerolaena ventricosa	Salt Bindyi	Native		
Senecio gawlerensis	Gawler Ranges Groundsel	Native		
Senecio glossanthus	Annual Groundsel	Native		
Senecio gregorii	Fleshy Groundsel	Native		
Senecio quadridentatus	Cotton Groundsel	Native		
Senecio spanomerus	Variable Groundsel	Native		
Senna artemisioides ssp. filifolia	Fine-leaf Desert Senna	Native		
Senna artemisioides ssp. petiolaris	Cassia / Senna sp.	Native		
Senna artemisioides ssp. X artemisioides	Silver Senna	Native		
Senna artemisioides ssp. X coriacea	Broad-leaf Desert Senna	Native		
Senna artemisioides ssp. X sturtii	Grey Senna	Native		
Senna cardiosperma ssp. gawlerensis	Gawler Ranges Senna	Native		
Senna pleurocarpa var. pleurocarpa	Stripe-pod Senna	Native		
Setaria basiclada	A Grass, no common name	Native		
Setaria clementii	Clement's Paspalidium	Native		
Setaria constricta	Knotty-butt Paspalidium	Native		
Sida ammophila	Sand Sida	Native		
Sida fibulifera	Pin Sida	Native		
Sida intricata	Twiggy Sida	Native		
Sida petrophila	Rock Sida	Native		
Sida phaeotricha	Hill Sida	Native		
Solanum coactiliferum	Tomato-bush	Native		
Solanum ellipticum	Velvet Potato-bush	Native		
Solanum esuriale	Quena	Native		
Solanum petrophilum	Rock Nightshade	Native		
Stemodia florulenta	Bluerod	Native		
Stenopetalum lineare	Narrow Thread-petal	Native		
Stuartina hamata	Prickly Cudweed	Native		
Swainsona stipularis	Orange Swainson-pea	Native		
Tecticornia indica ssp. leiostachya	Brown-head Samphire	Native		
Templetonia egena	Broombush Templetonia	Native		
Tetragonia eremaea	Desert Spinach	Native		
Tetragonia moorei	New Zealand Spinach	Native		
Threlkeldia diffusa	Coast Bonefruit	Native		
Thysanotus baueri	Mallee Fringe-lily	Native		
Toninia caeruleonigricans	A Fungus sp.	Native		
Trachymene ornata	Cotton-ball Trachymene	Native		
Tragus australianus	Small Burr-grass	Native		

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Trichanthodium skirrophorum	Woolly Yellow-heads	Native		
Triglochin isingiana	Spurred Arrowgrass	Native		
Triodia irritans	Spinifex	Native		
Triodia scariosa	Spinifex	Native		
Tripogon loliiformis	Five-minute Grass	Native		
Velleia arguta	Toothed Velleia	Native		
Vittadinia cervicularis var. cervicularis	Waisted New Holland Daisy	Native		
Vittadinia cuneata var. cuneata	Fuzzy New Holland Daisy	Native		
Vittadinia gracilis	Woolly New Holland Daisy	Native		
Wahlenbergia communis	Tufted Bluebell	Native		
Wahlenbergia gracilenta	Annual Bluebell	Native		
Wahlenbergia luteola	Yellow-wash Bluebell	Native		
Wahlenbergia preissii	Bluebell sp., no common name	Native		
Westringia rigida	Stiff Westringia	Native		
Wurmbea australis	Inland Nancy	Native		
Wurmbea dioica ssp. brevifolia	Early Nancy	Native		
Xanthoparmelia convoluta	Fungus sp. no common name	Native		
Zygophyllum ammophilum	Sand Twinleaf	Native		
Zygophyllum angustifolium	Scrambling Twinleaf	Native		
Zygophyllum apiculatum	Pointed Twinleaf	Native		
Zygophyllum aurantiacum ssp. aurantiacum	Shrubby Twinleaf	Native		
Zygophyllum confluens	Forked Twinleaf	Native		
Zygophyllum crenatum	Notched Twinleaf	Native		
Zygophyllum eremaeum	Climbing Twinleaf	Native		
Zygophyllum glaucum	Pale Twinleaf	Native		
Zygophyllum iodocarpum	Violet Twinleaf	Native		
Zygophyllum ovatum	Dwarf Twinleaf	Native		
Zygophyllum simile	White Twinleaf	Native		
Acetosa vesicaria	Rosy Dock	Exotic		
Aloe brevifolia	Aloe sp.	Exotic		
Aloe maculata	Broad-leaf Aloe	Exotic		
Alyssum linifolium	Flax-leaf Alyssum	Exotic		
Anagallis arvensis	Pimpernel	Exotic		
Asphodelus fistulosus	Onion Weed	Exotic		
Austrocylindropuntia cylindrica	Cane Cactus	Exotic		
Avellinia michelii	Avellinia	Exotic		
Avena barbata	Bearded Oat	Exotic		
Brassica sp.	Mustard family	Exotic		
Bromus diandrus	Great Brome	Exotic		
Bromus rubens	Red Brome	Exotic		
Calendula arvensis	Field Marigold	Exotic		
Carrichtera annua	Ward's Weed	Exotic		
Carthamus lanatus	Saffron Thistle	Exotic		

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Catapodium rigidum	Rigid Fescue	Exotic		
Cenchrus ciliaris / pennisetiformis	**Buffel Grass**	Exotic		
Cenchrus setaceus	Fountain Grass	Exotic		
Centaurea calcitrapa	Star Thistle	Exotic		
Centaurea melitensis	Malta Thistle	Exotic		
Cerastium glomeratum	Common Mouse-ear Chickweed	Exotic		
Chenopodium murale	Nettle-leaf Goosefoot	Exotic		
Chloris gayana	Rhodes Grass	Exotic		
Chondrilla juncea	Skeleton Weed	Exotic		
Cirsium vulgare	Spear Thistle	Exotic		
Citrullus colocynthis	Colocynth	Exotic		
Citrullus lanatus	Bitter Melon	Exotic		
Cleretum papulosum ssp. papulosum	No common name	Exotic		
Cotyledon orbiculata var. orbiculata	Pig's Ear	Exotic		
Crassula tetragona ssp. robusta	Crassula	Exotic		
Cucumis myriocarpus	Paddy Melon	Exotic		
Cylindropuntia imbricata	Devil's Rope Pear	Exotic		
Cylindropuntia rosea	Hudson Pear (Cactus)	Exotic		
Cynodon dactylon var. dactylon	Couch	Exotic		
Diplotaxis tenuifolia	Lincoln Weed	Exotic		
Dittrichia graveolens	Stinkweed	Exotic		
Echinopsis oxygona	Cactus sp.	Exotic		
Echium plantagineum	Salvation Jane	Exotic		
Emex australis	Three-corner Jack	Exotic		
Eragrostis curvula	African Love-grass	Exotic		
Eragrostis trichophora	Hairyflower Lovegrass	Exotic		
Erodium botrys	Long Heron's-bill	Exotic		
Erodium cicutarium	Cut-leaf Heron's-bill	Exotic		
Erodium moschatum	Musky Herons-bill	Exotic		
Eruca sativa	Purple-vein Rocket	Exotic		
Galenia pubescens var. pubescens	Coastal Galenia	Exotic		
Galium murale	Small Bedstraw	Exotic		
Gazania linearis	Gazania	Exotic		
Helianthus annuus	Sunflower	Exotic		
Herniaria cinerea	Rupturewort	Exotic		
Hordeum glaucum	Blue Barley-grass	Exotic		
Lamarckia aurea	Toothbrush Grass	Exotic		
Limonium lobatum	Winged Sea-lavender	Exotic		
Lolium rigidum	Wimmera Ryegrass	Exotic		
Lycium ferocissimum	African Boxthorn	Exotic		
Malephora crocea	Iceplant sp.	Exotic		
Malva parviflora	Small-flower Marshmallow	Exotic		
Marrubium vulgare	Horehound	Exotic		

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Medicago minima var. minima	Little Medic	Exotic		
Medicago sp.	Medic	Exotic		
Mesembryanthemum aitonis	Angled Iceplant	Exotic		
Mesembryanthemum crystallinum	Common Iceplant	Exotic		
Mesembryanthemum nodiflorum	Slender Iceplant	Exotic		
Nicotiana glauca	Tree Tobacco	Exotic		
Oenothera stricta ssp. stricta	Common Evening Primrose	Exotic		
Oligocarpus calendulaceus	Marigold sp.	Exotic		
Opuntia elata	Riverina Pear	Exotic		
Opuntia elatior	**Red-flower Prickly Pear**	Exotic		
Opuntia ficus-indica	Indian Fig	Exotic		
Opuntia microdasys	Bunny-ears	Exotic		
Opuntia monacantha	Drooping Prickly Pear	Exotic		
Opuntia polyacantha var. erinacea	Grizzly Bear Cactus	Exotic		
Opuntia puberula	Prickly Pear sp.	Exotic		
Opuntia stricta	Erect Prickly Pear	Exotic		
Orbea variegata	Carrion-flower	Exotic		
Oxalis pes-caprae	Soursob	Exotic		
Pentameris airoides ssp. airoides	False Hair-grass	Exotic		
Piptatherum miliaceum	Rice Millet	Exotic		
Polypogon viridis	Water Bent	Exotic		
Portulacaria afra	Dwarf Jade Plant	Exotic		
Reichardia tingitana	False Sowthistle	Exotic		
Rostraria pumila	Tiny Bristle-grass	Exotic		
Rumex crispus	Curled Dock	Exotic		
Rumex pulcher ssp. pulcher	Fiddle Dock	Exotic		
Sagina apetala	Annual Pearlwort	Exotic		
Salvia verbenaca var.	Wild Sage	Exotic		
Schinus molle	Pepper-tree	Exotic		
Schismus barbatus	Arabian Grass	Exotic		
Silene nocturna	Mediterranean Catchfly	Exotic		
Sisymbrium erysimoides	Smooth Mustard	Exotic		
Sisymbrium irio	London Mustard	Exotic		
Solanum nigrum	Black Nightshade	Exotic		
Sonchus oleraceus	Common Sow-thistle	Exotic		
Spergularia diandra	Lesser Sand-spurrey	Exotic		
Tagetes erecta	Marigold sp.	Exotic		
Urochloa panicoides var. panicoides	Grass sp.	Exotic		
Vulpia myuros f. myuros	Rat's-tail Fescue	Exotic		
Xanthium spinosum	Bathurst Burr	Exotic		

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Table F2: Reptiles and Amphibian BDBSA Records within 5km of the CEA

SPECIES	COMNAME	EPBC[1]	NPW[2]
Anilios bituberculatus	Rough-nosed Blind Snake		
Cryptoblepharus australis	Desert Wall Skink		
Ctenophorus chapmani	Prickly Dragon		
Ctenophorus cristatus	Crested Dragon		
Ctenophorus fionni	Peninsula Dragon		
Ctenophorus pictus	Painted Dragon		
Ctenotus olympicus	Saltbush Ctenotus		
Ctenotus orientalis	Spotted Ctenotus		
Ctenotus regius	Eastern Desert Ctenotus		
Ctenotus robustus	Eastern Striped Skink		
Ctenotus schomburgkii	Sandplain Ctenotus		
Demansia reticulata	Desert Whipsnake		
Diplodactylus furcosus	Ranges Stone Gecko		
Diplodactylus tessellatus	Tessellated Gecko		
Gehyra variegata	Tree Dtella		
Heteronotia binoei	Bynoe's Gecko		
Lerista edwardsae	Myall Slider		
Lerista terdigitata	Southern Three-toed Slider		
Lerista timida	Dwarf Three-toed Slider		
Lucasium damaeum	Beaded Gecko		
Menetia greyii	Dwarf Skink		
Morethia boulengeri	Common Snake-eye		
Pogona vitticeps	Central Bearded Dragon		
Pseudechis australis	Mulga Snake		
Pseudonaja aspidorhyncha	Patch-nosed Brown Snake		
Pseudonaja mengdeni	Gwardar		
Pseudonaja nuchalis (NC)	Western Brown Snake		
Pygopus schraderi	Hooded Scaly-foot		
Simoselaps bertholdi	Desert Banded Snake		
Strophurus intermedius	Southern Spiny-tailed Gecko		
Suta suta	Curl Snake		
Tiliqua rugosa	Sleepy Lizard		
Tympanocryptis lineata	Five-lined Earless Dragon		
Varanus gouldii	Sand Goanna		
Limnodynastes tasmaniensis	Spotted Marsh Frog		
Neobatrachus pictus	Burrowing frog		
Neobatrachus sudelli	Sudell's Frog		

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[2] South Australian *National Parks and Wildlife Act 1974 (*NPW Act) status: Endangered (E), Vulnerable (V), Rare (R),

Table F3: Bird BDBSA Records within 5km of the CEA

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Acanthiza iredalei iredalei	Slender-billed Thornbill (western ssp)	Native		R
Actitis hypoleucos	Common Sandpiper	Native	MM, LM	R
Amytornis textilis NC	Thick-billed Grasswren	Native	VU	
Ardeotis australis	Australian Bustard	Native		V
Arenaria interpres	Ruddy Turnstone	Native	MM, LM	R
Biziura lobata	Musk Duck	Native	LM	R
Cacatua leadbeateri	Major Mitchell's Cockatoo	Native		R
Calidris tenuirostris	Great Knot	Native	MM	R
Charadrius leschenaultii	Greater Sand Plover	Native	MM	R
Cinclosoma castanotum	Chestnut-backed Quailthrush (Chestnut Quailthrush)	Native		ssp
Cladorhynchus leucocephalus	Banded Stilt	Native		V
Egretta garzetta	Little Egret	Native	MM, LM	R
Emblema pictum	Painted Finch	Native		R
Falco hypoleucos	Grey Falcon	Native		R
Falco peregrinus	Peregrine Falcon	Native		R
Haematopus longirostris	(Australian) Pied Oystercatcher	Native		R
Haliaeetus leucogaster	White-bellied Sea-Eagle	Native	MT, LM	E
Limosa lapponica	Bar-tailed Godwit	Native	MW, LM	R
Melanodryas cucullata	Hooded Robin	Native		ssp
Microeca fascinans	Jacky Winter	Native		ssp
Neophema elegans	Elegant Parrot	Native		R
Northiella haematogaster	Bluebonnet	Native		ssp
Numenius madagascariensis	Far Eastern Curlew	Native	MM	V
Pachycephala inornata	Gilbert's Whistler	Native		R
Sterna hirundo	Common Tern	Native	MM	R
Stictonetta naevosa	Freckled Duck	Native		V
Strepera versicolor	Grey Currawong	Native		ssp
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	Native		
Acanthiza apicalis	Inland Thornbill	Native		
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	Native		
Acanthiza uropygialis	Chestnut-rumped Thornbill	Native		
Accipiter cirrocephalus	Collared Sparrowhawk	Native		

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Aegotheles cristatus	Australian Owlet-nightjar	Native		
Alauda arvensis	Eurasian Skylark	Exotic		
Amytornis textilis	Western Grasswren	Native		
Anas castanea	Chestnut Teal	Native		
Anas gracilis	Grey Teal	Native		
Anas superciliosa	Pacific Black Duck	Native		
Anthochaera carunculata	Red Wattlebird	Native		
Anthus australis	Australian Pipit	Native		
Aphelocephala leucopsis	Southern Whiteface	Native		
Apus pacificus	Pacific Swift (Fork-tailed Swift)	Native	MM, LM	
Aquila audax	Wedge-tailed Eagle	Native		
Ardea pacifica	White-necked Heron	Native		
Artamus cinereus	Black-faced Woodswallow	Native		
Artamus cyanopterus	Dusky Woodswallow	Native		
Artamus minor	Little Woodswallow	Native		
Artamus personatus	Masked Woodswallow	Native		
Artamus superciliosus	White-browed Woodswallow	Native		
Aythya australis	Hardhead	Native		
Barnardius zonarius	Australian Ringneck	Native		
Cacatua sanguinea	Little Corella	Native		
Cacomantis flabelliformis	Fan-tailed Cuckoo	Native		
Cacomantis pallidus	Pallid Cuckoo	Native		
Calamanthus (Calamanthus) campestris	Rufous Fieldwren	Native		
Calidris acuminata	Sharp-tailed Sandpiper	Native	MW, LM	
Calidris canutus	Red Knot	Native	MW, LM	
Calidris ferruginea	Curlew Sandpiper	Native	MW, LM	
Calidris ruficollis	Red-necked Stint	Native	MW, LM	
Certhionyx variegatus	Pied Honeyeater	Native		
Chalcites basalis	Horsfield's Bronze Cuckoo	Native		
Chalcites osculans	Black-eared Cuckoo	Native		
Charadrius ruficapillus	Red-capped Plover	Native	LM	
Charadrius veredus	Oriental Plover	Native		
Chenonetta jubata	Maned (Australian Wood Duck)	Native		
Cheramoeca leucosterna	White-backed Swallow	Native		
Chlidonias hybrida	Whiskered Tern	Native		
Chroicocephalus novaehollandiae	Silver Gull	Native		
Cincloramphus cruralis	Brown Songlark	Native		
Cincloramphus mathewsi	Rufous Songlark	Native		

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Cinclosoma cinnamomeum	Cinnamon Quailthrush	Native		
Circus assimilis	Spotted Harrier	Native		
Climacteris rufus	Rufous Treecreeper	Native		
Colluricincla harmonica	Grey Shrikethrush	Native		
Columba livia	Feral Pigeon [Rock Dove]	Exotic		
Coracina maxima	Ground Cuckooshrike	Native		
Coracina novaehollandiae	Black-faced Cuckooshrike	Native		
Corvus bennetti	Little Crow	Native		
Corvus coronoides	Australian Raven	Native		
Corvus mellori	Little Raven	Native		
Coturnix pectoralis	Stubble Quail	Native		
Cracticus torquatus	Grey Butcherbird	Native		
Cygnus atratus	Black Swan	Native		
Daphoenositta chrysoptera	Varied Sittella	Native		
Dicaeum hirundinaceum	Mistletoebird	Native		
Dromaius novaehollandiae	Emu	Native		
Egretta novaehollandiae	White-faced Heron	Native		
Elanus axillaris	Black-shouldered Kite	Native		
Elseyornis melanops	Black-fronted Dotterel	Native		
Eolophus roseicapilla	Galah	Native		
Eopsaltria griseogularis	Western Yellow Robin	Native		
Epthianura albifrons	White-fronted Chat	Native		
Epthianura aurifrons	Orange Chat	Native		
Epthianura tricolor	Crimson Chat	Native		
Erythrogonys cinctus	Red-kneed Dotterel	Native		
Falco berigora	Brown Falcon	Native		
Falco cenchroides	Nankeen Kestrel	Native		
Falco longipennis	Australian Hobby	Native		
Falco subniger	Black Falcon	Native		
Fulica atra	Eurasian Coot	Native		
Gavicalis virescens	Singing Honeyeater	Native		
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	Native		
Grallina cyanoleuca	Magpielark	Native		
Gymnorhina tibicen	Australian Magpie	Native		
Haliastur sphenurus	Whistling Kite	Native		
Hieraaetus morphnoides	Little Eagle	Native		
Himantopus leucocephalus	White-headed Stilt	Native		
Hirundo neoxena	Welcome Swallow	Native		

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Hydroprogne caspia	Caspian Tern	Native		
Lalage tricolor	White-winged Triller	Native		
Malacorhynchus membranaceus	Pink-eared Duck	Native		
Malurus lamberti	Variegated Fairywren	Native		
Malurus leucopterus	White-winged Fairywren	Native		
Malurus pulcherrimus	Blue-breasted Fairywren	Native		
Malurus splendens	Splendid Fairywren	Native		
Manorina flavigula	Yellow-throated Miner	Native		
Melithreptus brevirostris	Brown-headed Honeyeater	Native		
Melopsittacus undulatus	Budgerigar	Native		
Microcarbo melanoleucos	Little Pied Cormorant	Native		
Milvus migrans	Black Kite	Native		
Mirafra javanica	Horsfield's Bush Lark	Native		
Neopsephotus bourkii	Bourke's Parrot	Native		
Nesoptilotis leucotis	White-eared Honeyeater	Native		
Ninox boobook	Southern Boobook	Native		
Northiella haematogaster haematogaster (NC)	Yellow-vented Bluebonnet	Native		
Nymphicus hollandicus	Cockatiel	Native		
Ocyphaps lophotes	Crested Pigeon	Native		
Oreoica gutturalis	Crested Bellbird	Native		
Pachycephala pectoralis	Australian Golden Whistler (Golden Whistler)	Native		
Pachycephala rufiventris	Rufous Whistler	Native		
Pardalotus punctatus	Spotted Pardalote	Native		
Pardalotus striatus	Striated Pardalote	Native		
Passer domesticus	House Sparrow	Exotic		
Pelecanus conspicillatus	Australian Pelican	Native		
Peltohyas australis	Inland Dotterel	Native		
Petrochelidon ariel	Fairy Martin	Native		
Petrochelidon nigricans	Tree Martin	Native		
Petroica goodenovii	Red-capped Robin	Native		
Phalacrocorax sulcirostris	Little Black Cormorant	Native		
Phalacrocorax varius	[Australian] Pied Cormorant	Native		
Phaps chalcoptera	Common Bronzewing	Native		
Platalea flavipes	Yellow-billed Spoonbill	Native		
Platycercus elegans	Crimson Rosella	Native		
Pluvialis squatarola	Grey Plover	Native		
Poliocephalus poliocephalus	Hoary-headed Grebe	Native		
Pomatostomus superciliosus	White-browed Babbler	Native		

SPECIES	COMNAME	Native or Exotic	EPBC[1]	NPW[2]
Porzana fluminea	Australian Crake (Australian Spotted Crake)	Native		
Psephotus varius	Mulga Parrot	Native		
Psophodes cristatus	Chirruping Wedgebill	Native		
Ptilotula ornata	Yellow-plumed Honeyeater	Native		
Ptilotula plumula	Grey-fronted Honeyeater	Native		
Purnella albifrons	White-fronted Honeyeater	Native		
Pyrrholaemus brunneus	Redthroat	Native		
Recurvirostra novaehollandiae	Red-necked Avocet	Native		
Rhipidura albiscapa	Grey Fantail	Native		
Rhipidura leucophrys	Willie Wagtail	Native		
Smicrornis brevirostris	Weebill	Native		
Sturnus vulgaris	Common Starling	Exotic		
Sugomel niger	Black Honeyeater	Native		
Tachybaptus novaehollandiae	Australasian Grebe	Native		
Taeniopygia guttata	Zebra Finch	Native		
Thalasseus bergii	Greater Crested Tern	Native		
Todiramphus pyrrhopygius	Red-backed Kingfisher	Native		
Tribonyx ventralis	Black-tailed Native Hen	Native		
Tringa nebularia	Common Greenshank	Native		
Tringa stagnatilis	Marsh Sandpiper	Native		
Turnix velox	Little Buttonquail	Native		
Vanellus miles	Masked Lapwing	Native		
Vanellus tricolor	Banded Lapwing	Native		
Zosterops lateralis	Silvereye	Native		

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Table F4: Mammal BDBSA Records within 5km of the CEA

SPECIES	COMNAME	Native or Exotic	EPBC	NPW
Capra hircus	Goat (Feral Goat)	Exotic		
Chalinolobus gouldii	Gould's Wattled Bat	Native		
Equus caballus	Horse (Brumby)	Exotic		
Felis catus	Domestic Cat (Feral Cat)	Exotic		
Leporillus sp.	Stick-nest Rats	Native		
Macropus fuliginosus	Western Grey Kangaroo	Native		
Macropus robustus	Euro	Native		

Macropus rufus	Red Kangaroo	Native		
Mormopterus species 3	Inland Free-tailed Bat	Native		
Mormopterus spp. (species complex) (NC)	Southern Freetail-bats	Native		
Mus musculus	House Mouse	Exotic		
Notomys mitchellii	Mitchell's Hopping-mouse	Native		
Nyctophilus geoffroyi	Lesser Long-eared Bat	Native		
Nyctophilus major	Central Long-eared Bat	Native		
Oryctolagus cuniculus	Rabbit (European Rabbit)	Exotic		
Scotorepens balstoni	Inland Broad-nosed Bat	Native		
Sminthopsis crassicaudata	Fat-tailed Dunnart	Native		
Sminthopsis macroura	Stripe-faced Dunnart	Native		
Vespadelus baverstocki	Inland Forest Bat	Native		
Vulpes vulpes	Fox (Red Fox)	Exotic		

[1] National *Environment Protection and Biodversity Conservation Act* 1999 (EPBC Act) status: Endangered (EN), Vulnerable (VU), Migratory Marine (MM);

[2] South Australian *National Parks and Wildlife Act 1974* (NPW Act) status: Endangered (E), Vulnerable (V), Rare (R),

Appendix G. Vegetation communities into Regional Vegetation Classification system (BCCM)

Table G1: Habitat types found in the CEA – AECOM (2012a) and JACOBS (2015a) data united by BCCM

Broad habitat types and habitat types (AECOM)	Broad habitat type (Jacobs)	Percent cover (CEA Area) - % (AECOM)	BCCM	Average flora species richness (Jacobs)		Average bird species richness (AECOM)
			Community Type	Native	Exotic	Avg. Species per Site
Drainage Line						
Lignum Swamp	*Duma florulenta* (lignum) open shrubland swamp (Site 1)	0.0	**(NON-EP COMM)** Lignum open shrubland swamp	22	7	
Melaleuca Creek	-	0.2	**(NON EP COMM)** Boree +/- yorrell tall open shrubland			19
Bullock Bush/Myall and Acacia over Blackbush	-	1.5	EP9.1 (western myall +/- false sandalwood low open woodlands)			10.5
Blackbush		6.2	EP9.2 Chenopod open shrublands			8.83
Blackoak						
Black Oak Plain	*Casuarina pauper* (blackoak) open woodland over chenopod low open shrubland on calcareous sandyplain (Site 2)	3.6	EP9.1 (black oak open woodland and woodland with chenopod shrub understorey)	21	2	5.67
Black Oak and Myall over Bluebush		3.9	EP9.1 (western myall +/- false sandalwood low open woodlands)			15.67
Black Oak and *Myoporum*		0.7	EP9.1 (black oak open woodland and woodland with chenopod shrub understorey)			8.25

Broad habitat types and habitat types (AECOM)	Broad habitat type (Jacobs)	Percent cover (CEA Area) - % (AECOM)	BCCM	Average flora species richness (Jacobs)		Average bird species richness (AECOM)
			Community Type	Native	Exotic	Avg. Species per Site
Black Oak Slopes		1.2	EP 9.1 (black oak open woodland and woodland with chenopod shrub understorey)			9.67
Mallee						
Mixed Mallee Plains	*Eucalyptus oleosa* (red mallee) / *Eucalyptus gracilis* (yorrell) open tree mallee (Site 3) *Eucalyptus oleosa* (red mallee) / *Eucalyptus gracilis* (yorrell) open tree mallee (Site C)	1.0	EP9.1 (red mallee +/- yorrell mallee with chenopod understorey)	37	0	12
Mixed Mallee of Arcoona Slopes		1.7	EP9.1 (red mallee +/- yorrell mallee with chenopod understorey)	22	0	8.5
Mixed Mallee Plains over Triodia	-	0.2	EP5.1 (mallee on sandy loams of inland swales and low dunes)			11
Mulga						
Mulga with *Eremophila* Scrub over Bluebush	-	0.0	n/a – (probably EP9.1 with absence of Myall)			
Mulga and Myall with *Acacia burkittii* over Blackbush	-	0.2	EP9.1 (western myall +/- false sandalwood low open woodlands)			
Melaleuca uplands						
Melaleuca over Triodia	*Melaleuca pauperiflora* / *Maireana sedifolia* open shrubland over *Triodia scariosa* hummock grassland stony plateau (Site A)	0.4	**(NON EP COMM)** boree and bluebush low open shrubland over triodia	18	1	7.25

Broad habitat types and habitat types (AECOM)	Broad habitat type (Jacobs)	Percent cover (CEA Area) - % (AECOM)	BCCM	Average flora species richness (Jacobs)		Average bird species richness (AECOM)
			Community Type	Native	Exotic	Avg. Species per Site
Mixed woodland and scrub of gully slopes						
Callitris Woodland of Gully Slopes of Mt Whyalla	-	0.1	EP 7.1 (woodlands and mallee with mid-dense sclerophyll shrub understorey)			12
Callitris Woodland of Rocky Outcrop of Mt Whyalla	-	0.0	EP 7.1 (woodlands and mallee with mid-dense sclerophyll shrub understorey)			12
Myoporum/Dodonaea with *Callitris* of Arcoona Plateau/Gullies	-	0.8	EP 7.1 (woodlands and mallee with mid-dense sclerophyll shrub understorey)			11.5
Senna/Eremophila/Dodonaea Scrub of Gully Slopes	-	0.0	EP 7.1 (woodlands and mallee with mid-dense sclerophyll shrub understorey)			2
Myall plain *						
Myall over Mixed Chenopods	*Acacia papyrocarpa* (western myall) low open woodland over mixed chenopod low open shrubland (Site 5)	7.7	EP9.1 (western myall +/- false sandalwood low open woodlands)	39	7	12.5
Myall over Blackbush		4.8	EP9.1 (western myall +/- false sandalwood low open woodlands)			12
Myall with Bullock Bush over Saltbush		2.4	EP9.1 (western myall +/- false sandalwood low open woodlands)			12

Broad habitat types and habitat types (AECOM)	Broad habitat type (Jacobs)	Percent cover (CEA Area) - % (AECOM)	BCCM	Average flora species richness (Jacobs)		Average bird species richness (AECOM)
			Community Type	Native	Exotic	Avg. Species per Site
Myall with Bullock Bush over Blackbush and Bluebush		10.0	EP9.1 (western myall +/- false sandalwood low open woodlands)			13.33
Myall with Myoporum over Bluebush		11.3	EP9.1 (western myall +/- false sandalwood low open woodlands)			7.75
Blackbush slopes						
Blackbush and Mixed Chenopod Slopes		0.2	EP9.2 Chenopod open shrublands			2
Bluebush plains						
Bluebush and Mixed Chenopod Plains	*Maireana pyramidata* (blackbush) / *M. sedifolia* (pearl bluebush) low open shrubland alluvial plain (Site 4)	6.4	EP9.2 Chenopod open shrublands	29	9	8.33
Bluebush and Saltbush Plain		12.5	EP9.2 (Chenopod open shrublands)			5
Bluebush uplands						
Eremophila/Bluebush Hillocks		1.1	EP9.2 (Bluebush Shrubland)			9.33
Bluebush/Scaevola Shrubland of Hillocks and Plateau		3.1	EP9.2 (Bluebush Shrubland)			6.33
Saltbush flats						
Saltbush/Blackbush Flats	*Atriplex vesicaria* (bladder saltbush) / *Maireana pyramidata* (blackbush) low open shrubland alluvial plain (Site 6)	6.6	EP 9.2 (Bladder Saltbush Shrubland)	25	3	6
Saltbush Flats		2.2	EP 9.2 (Bladder Saltbush Shrubland)			4

Broad habitat types and habitat types (AECOM)	Broad habitat type (Jacobs)	Percent cover (CEA Area) - % (AECOM)	BCCM	Average flora species richness (Jacobs)		Average bird species richness (AECOM)
			Community Type	Native	Exotic	Avg. Species per Site
Saltbush/Tecticornia Flats		2.6	EP9.2 (Bladder Saltbush Shrubland) refer BCMM pg 132, paragraph 6)			6.33

[1] Species diversity from AECOM (2012a) and Jacobs (2015a), BCCM ratings from BCCM EP region, manual 3 (vegetation communities of the Eyre Peninsula region)

Appendix H. Protected Matters Search Tool Results

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Appendix I. Desktop Summaries

Table I1: Conservation fauna flagged as potentially present (EPBC) within the study area

Species Name	Common Name	EPBC Act[1]	SA NPW Act[2]	EPBC Likelihood of Occurrence
Birds				
Amytornis textilis myall	Western Grasswren (Gawler Ranges)	VU		Species or species habitat known to occur within area
Apus pacificus	Fork-tailed swift	MM, LM		Species or species habitat may occur within area
Ardea alba	Great Egret	MW, LM		Species or species habitat likely to occur within area
Ardea ibis	Cattle Egret	MW, LM	R	Species or species habitat likely to occur within area
Arenaria interpres	Ruddy Turnstone	MW, LM	R	Species or species habitat known to occur within area
Calidris acuminata	Sharp-tailed Sandpiper	MW, LM		Species or species habitat known to occur within area
Calidris alba	Sanderling	MW, LM		Species or species habitat likely to occur within area
Calidris canutus	Red Knot	MW, LM		Species or species habitat known to occur within area
Calidris ferruginea	Curlew Sandpiper	MW, LM		Species or species habitat known to occur within area
Calidris ruficollis	Red-necked Stint	MW, LM		Species or species habitat known to occur within area
Calidris tenuirostris	Great Knot	MW, LM	R	Species or species habitat known to occur within area
Charadrius leschenaultii	Greater Sand Plover	MW, LM		Species or species habitat known to occur within area
Charadrius ruficapillus	Red-capped Plover	LM		Species or species habitat known to occur within area
Charadrius veredus	Oriental Plover	MW, LM		Species or species habitat may occur within area
Diomedea epomophora epomophora	Southern Royal Albatross	VU, MM, LM	V	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora sanfordi	Northern Royal Albatross	EN, MM, LM	E	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans (sensu lato)	Wandering Albatross	VU, MM, LM	V	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans antipodensis	Antipodean Albatross	VU, MM, LM		Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans exulans	Tristan Albatross	EN, MM, LM		Species or species habitat may occur within area
Gallinago hardwickii	Latham's Snipe	MW, LM	R	Species or species habitat may occur within area
Gallinago stenura	Pin-tailed Snipe	LM		Species or species habitat known to occur within area
Haliaeetus leucogaster	White-bellied Sea-Eagle	MT, LM	E	Species or species habitat likely to occur within area

Species Name	Common Name	EPBC Act[1]	SA NPW Act[2]	EPBC Likelihood of Occurrence
Himantopus himantopus	Black-winged Stilt	LM		Species or species habitat known to occur within area
Leipoa ocellata	Malleefowl	VU	V	Species or species habitat likely to occur within area
Limosa lapponica	Bar-tailed Godwit	MW, LM	R	Species or species habitat known to occur within area
Macronectes giganteus	Southern Giant-Petrel	EN, MM, LM	V	Species or species habitat may occur within area
Macronectes halli	Nortern Giant-Petrel	VU, MM, LM		Species or species habitat may occur within area
Merops ornatus	Rainbow Bee-eater	MT, LM		Species or species habitat may occur within area
Numenius madagascariensis	Eastern Curlew	MW, LM	VU	Species or species habitat known to occur within area
Pandion haliaetus/cristatus	Osprey	LM	E	Species or species habitat may occur within area
Philomachus pugnax	Ruff	LM	R	Species or species habitat known to occur within area
Puffinus carneipes	Flesh-footed Shearwater	MM, LM	R	Foraging, feeding or related behaviour likely to occur within area
Recurvirostra novaehollandiae	Red-necked Avocet	LM		Species or species habitat known to occur within area
Rostratula australis	Australian Painted Snipe	EN, MW, LM	V	Species or species habitat may occur within area
Sterna fuscata	Sooty Tern	LM		Breeding known to occur within area
Sternula nereis nereis	Australian Fairy Tern	VU, LM	E	Breeding known to occur within area
Thalassarche cauta cauta	Shy Albatross	VU, MM, LM	V	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi	White-capped Albatross	VU, MM, LM		Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris	Black-browed Albatross	VU, MM, LM	E	Species or species habitat may occur within area
Thalassarche melanophris impavida	Campbell Albatross	VU, MM, LM	V	Species or species habitat may occur within area
Tringa stagnatilis	Marsh Sandpiper	MW, LM		Species or species habitat may occur within area

[1] National *Environment Protection and Biodversity Conservation Act* 1999 (EPBC Act) status: Endangered (EN), Vulnerable (VU), Migratory Marine (MM);

[2] South Australian *National Parks and Wildlife Act 1974 (*NPW Act) status: Endangered (E), Vulnerable (V), Rare (R),

Table I2: Conservation fauna previously recorded within 5km (BDBSA)

Species Name	Common Name	EPBC Act[1]	SA NPW Act[2]	BDBSA Recent Record
Birds				
Amytornis textilis myall	Western (Thick-billed Gawler Ranges) Grasswren	VU		27/07/2005
Acanthiza iredalei iredalei	Slender-billed Thornbill (western ssp)		R	28/08/2006
Actitis hypoleucos	Common Sandpiper	MM	R	29/10/2001
Ardeotis australis	Australian Bustard		V	31/12/2006
Arenaria interpres	Ruddy Turnstone	MM	R	13/02/1983
Biziura lobata	Musk Duck		R	18/06/2001
Cacatua leadbeateri	Major Mitchell's Cockatoo		R	7/08/2000
Calidris tenuirostris	Great Knot	MM	R	13/02/1983
Charadrius leschenaultii	Greater Sand Plover	MM	R	4/02/1984
Cinclosoma castanotum	Chestnut-backed Quailthrush (Chestnut Quailthrush)		ssp	3/08/2006
Cladorhynchus leucocephalus	Banded Stilt		V	7/02/1985
Egretta garzetta	Little Egret		R	26/01/2000
Emblema pictum	Painted Finch		R	31/12/1974
Falco hypoleucos	Grey Falcon		R	17/07/1998
Falco peregrinus	Peregrine Falcon		R	28/03/1991
Haematopus longirostris	(Australian) Pied Oystercatcher		R	7/02/1985
Haliaeetus leucogaster	White-bellied Sea-Eagle	MM	E	26/01/2000
Limosa lapponica	Bar-tailed Godwit	MM	R	7/02/1985
Melanodryas cucullata	Hooded Robin		ssp	12/09/2007
Microeca fascinans	Jacky Winter		ssp	14/09/2007
Neophema elegans	Elegant Parrot		R	2/08/2006
Northiella haematogaster	Bluebonnet		ssp	2/08/2006
Numenius madagascariensis	Far Eastern Curlew	MM	V	4/02/1984
Pachycephala inornata	Gilbert's Whistler		R	19/09/1925

Sterna hirundo	Common Tern	MM	R	26/01/2000
Stictonetta naevosa	Freckled Duck		V	30/07/2001
Strepera versicolor	Grey Currawong		ssp	12/09/2007

[1] National *Environment Protection and Biodversity Conservation Act* 1999 (EPBC Act) status: Endangered (EN), Vulnerable (VU), Migratory Marine (MM);
[2] South Australian *National Parks and Wildlife Act 1974 (*NPW Act) status: Endangered (E), Vulnerable (V), Rare (R),

Appendix J. Likelihood Assessment Tables

Table J1: EPBC / NPW listed fauna species (all birds) considered unlikely to occur.

Species Name	Common Name	EPBC Act[1]	SA NPW Act[2]	Why unlikely to occur?
Actitis hypoleucos	Common Sandpiper	MM, LM	R	Known to use coastal and inland habitats including banks, rocks, dams and sandy beaches near water (Simpson and Day 2004). Three BDBSA records within 5km of the CEA boundary, the closest inside Pandurra Station in 2001. No suitable habitat within the CEA, but may occur as an infrequent visitor to the area. Unlikely to occur in significant numbers.
Arenaria interpres	Ruddy Turnstone	MW, LM	R	Known to use coastal habitats with rocky shores (Simpson and Day 2004), coral and sand islands, and less commonly on intertidal mudflats (Geering *et al* 2008). One BDBSA record from 1983 in the intertidal mudflats 2.4 km south of the CEA. No suitable habitat within the CEA.
Biziura lobata	Musk Duck	LM	R	Known to prefer inland habitats of permanent swamps with dense vegetation, large open lakes and coastal habitats of tidal inlets and bays (Simpson and Day 2004). Closest BDBSA record is 4.8 km south of CEA boundary, in the Port Lowly tidal flats. No suitable habitat within the CEA.
Calidris acuminata	Sharp-tailed Sandpiper	MW, LM		Known to use coastal habitats and inland habitats including intertidal mudflats and fresh or brackish wetlands (Geering et al. 2008). Three BDBSA records in the intertidal mudflats 2.4 km south of the CEA, the most recent from 1985. No suitable habitat within the CEA.
Calidris alba	Sanderling	MW, LM		Known to use sandy ocean beaches, and occasionally intertidal mudflats, rarely inland (Geering et al 2008). No BDBSA records within 5km of the CEA. No suitable habitat within the CEA.
Calidris canutus	Red Knot	MW, LM		Known to use intertidal mud and sandflats, rarely inland (Geering et al 2008). Three BDBSA records in the intertidal mudflats 2.4 km south of the CEA, the most recent from 1985. No suitable habitat within the CEA.
Calidris ferruginea	Curlew Sandpiper	MW, LM		Known to forage on intertidal mudflats, and less frequently on inland freshwater wetlands (Geering et al 2008). Four BDBSA records from 1985 in the intertidal mudflats 2.4 km south of the CEA. No suitable habitat within the CEA.
Calidris ruficollis	Red-necked Stint	MW, LM		Known to use coastal and inland saltwater habitats (Geering et al 2008). One BDBSA record from 2001 1.2 km north of the CEA, and four BDBSA records in the intertidal mudflats 2.4 km south of the CEA, the most recent from 1985. No suitable habitat within the CEA.
Calidris tenuirostris	Great Knot	MW, LM	R	Known to use intertidal mud and sandflats, rarely inland (Geering et al 2008). One BDBSA record in the intertidal mudflats 2.4 km south of the CEA, the most recent from 1983. No suitable habitat within the CEA.
Charadrius leschenaultii	Greater Sand Plover	MW, LM		Known to use coastal habitats, rarely inland (Simpson and Day 2004). Two BDBSA records in the intertidal mudflats 2.4 km south of the CEA, the most recent from 1984. No suitable habitat within the CEA.
Charadrius ruficapillus	Red-capped Plover	LM		Known to use coastal habitats including intertidal mudflats and sandy areas (Simpson and Day 2004). Also uses inland habitats including shorelines of brackish lakes, salt-marshes and occasionally freshwater lakes

Species Name	Common Name	EPBC Act[1]	SA NPW Act[2]	Why unlikely to occur?
				and rivers (Geering et al 2008). One BDBSA record 0.5 km inside the CEA boundary on Pandurra Station (from 2001). No suitable habitat within the CEA, unlikely to support viable population, but species may occur as an infrequent visitor to the area.
Charadrius veredus	Oriental Plover	MW, LM		Known to use dry grasslands (including airfields), thinly vegetated plains, recently burnt areas and occasionally coastal habitats (Geering et al 2008; Simpson and Day 2004). Limited suitable habitat within the CEA. One BDBSA record from 2001 0.5 km inside the CEA boundary on Pandurra Station. May occur as an occasional visitor. Unlikely to occur in significant numbers.
Cladorhynchus leucocephalus	Banded Stilt		V	Known to use coastal and inland habitats including beaches, mudflats, fresh and saltwater marshes and large temporary inland lakes (Simpson and Day 2004, Geering et al. 2008). Four BDBSA records 2.4 km south of CEA boundary, the most recent in 1985. No suitable habitat within the CEA.
Diomedea epomophora epomophora	Southern Royal Albatross	VU, MM, LM	V	Large, migratory seabird most commonly occupying oceanic and coastal sea habitats. On rare occasions, this species has been known to use coastal bay habitats (Simpson and Day 2004, and DEWHA 2010), but is generally aerial and flies over pelagic, off-shore and in-shore water (SPRAT). No BDBSA records within 50 km of the CEA. No preferred habitat within the CEA.
Diomedea epomophora sanfordi	Northern Royal Albatross	EN, MM, LM	E	Large, migratory seabird most commonly occupying oceanic and coastal sea habitats over the Southern Ocean, with most of the species breeding at the Chatham Islands (SPRAT). On rare occasions, this species has been known to use coastal bay habitats (Simpson and Day 2004, and DEWHA 2010), but is generally aerial and flies over pelagic, off-shore and in-shore water (SPRAT). No BDBSA records within 50 km of the CEA. No critical habitat within CEA.
Diomedea exulans (sensu lato)	Wandering Albatross	VU, MM, LM	V	Large, migratory seabird that breeds on Macquarie Island. On rare occasions, this species has been known to use coastal bay habitats (Simpson and Day 2004, and DEWHA 2010), but is generally aerial and flies over the Southern Ocean (SPRAT). No BDBSA records within 50 km of the CEA. No critical habitat within the CEA.
Diomedea exulans antipodensis	Antipodean Albatross	VU, MM, LM		Marine, pelagic and aerial species that is endemic to New Zealand, however forages widely in open water in the south-west Pacific Ocean, Southern Ocean and the Tasman Sea (SPRAT). Subspecies of the Wandering Albatross (SPRAT). No BDBSA records within 50km of the CEA. No critical habitat within the CEA.
Diomedea exulans exulans	Tristan Albatross	EN, MM, LM		Large, migratory seabird most commonly occupying oceanic and coastal sea habitats (Simpson and Day 2004, and DEWHA 2010), but is generally aerial and flies over pelagic, off-shore and in-shore water (SPRAT). No BDBSA records within 50 km of the CEA.
Emblema pictum	Painted Finch		R	Known to prefer stony hills and spinifex plains (Simpson and Day 2004). Only BDBSA record within 50 km is from 1974. No critical habitat within the CEA.
Gallinago hardwickii	Latham's Snipe	MW, LM	R	Known to use coastal and inland habitats including wetland grasses and open freshwater swamps (Simpson and Day 2004). No BDBSA records with 50 km from the CEA. No critical habitat within CEA.
Gallinago stenura	Pin-tailed Snipe	LM		Known to use coastal and inland habitats including wetland grasses and open freshwater swamps (Simpson and Day 2004). No suitable habitat within the CEA.

Species Name	Common Name	EPBC Act[1]	SA NPW Act[2]	Why unlikely to occur?
Haematopus longirostris	(Australian) Pied Oystercatcher		R	Known to use coastal habitats including beaches, mudflats, offshore islands, bays, inlets and rocky coasts and headlands around the entire Australian coast (Simpson and Day 2004, Geering et al. 2008). It is a habitat generalist with records scattered about much of the South Australian coast, but prefers sandy beaches and estuaries, particularly for nesting (Simpson and Day 2004, Geering et al. 2008). Four BDBSA records 2.4 km south of the CEA boundary, the most recent in 1984. No suitable habitat within the CEA.
Himantopus himantopus	Black-winged Stilt	LM		Known to use coastal habitats and inland habitats including fresh and saltwater marshes, and intertidal mudflats (Simpson and Day 2004 and Geering et al. 2008). No BDBSA records with 50 km from the CEA. No suitable habitat within the CEA.
Limosa lapponica	Bar-tailed Godwit	MW, LM	R	Known to use coastal habitats with intertidal mudflats, rarely far from the coast (Geering et al. 2008). Four BDBSA records in the intertidal mudflats 2.4 km south of the CEA, the most recent from 1985. No suitable habitat within the CEA.
Macronectes giganteus	Southern Giant-Petrel	EN, MM, LM	V	Species is widespread throughout the Southern Ocean, known to occur in Antarctic to subtropical waters. Breeding occurs on the Antarctic Continent, Peninsula, and Islands and on subantarctic islands and South America (SPRAT, Simpson and Day 2004). Known to over-winter in south-eastern Australian waters, along with South America, South Africa and New Zealand (SPRAT). Highly mobile, large and conspicuous species. It is unlikely that coastal habitat in the study area is critical to this species. Closest BDBSA record is 24 km from the CEA, near Port Augusta from 2000. Not expected that the study area provides essential habitat for this species.
Macronectes halli	Northern Giant-Petrel	VU, MM, LM		Species is widespread throughout the Southern Ocean, known to breed in the sub-Antarctic (SPRAT). They are known to over-winter in off the coast of south-eastern Australian waters (SPRAT). No BDBSA records within 50 km of the CEA. Species is large and highly mobile, not expected that the study area provides essential habitat for this species.
Melanodryas cucullata ssp. cucullata	Hooded Robin (South Eastern subspecies)	-	ssp. R	SA NPW Act listed subspecies has a home range that extends from east of Port Augusta through Victoria and into NSW and the south-eastern corner of Queensland (Simpson and Day 2004). Subspecies recorded in BDBSA records is more likely to be *Melanodryas cucullata westralensis*, which does not have a state conservation rating and has a known range in the CEA region (Simpson and Day 2004, Brandle 2010).
Microeca fascinans ssp. fascinans	Jacky Winter (South Eastern subspecies)	-	ssp. R	SA NPW Act listed subspecies has a home range from south-eastern South Australia, to Victoria, NSW and Queensland (Simpson and Day 2004). Study site is beyond the known limit of extent. BDBSA records do not specify which subspecies was recorded; but more likely to be *Microeca fascinans assimilis*, which does not have a state conservation rating, is dominant in the region (Simpson and Day 2004, Brandle 2010) and was recorded during the field survey.
Philomachus pugnax	Ruff	LM	R	Known to use inland habitats, favouring muddy freshwater wetlands, and brackish swamps and lakes, rarely observed in coastal habitats (Geering et al. 2008). Two BDBSA records in the intertidal mudflats more than 5 km south of the CEA, the most recent from 1981. No suitable habitat within the CEA.

Species Name	Common Name	EPBC Act[1]	SA NPW Act[2]	Why unlikely to occur?
Puffinus carneipes	Flesh-footed Shearwater	MM, LM	R	Species is a trans-equatorial migrant, known to use oceanic and coastal habitats (Simpson and Day 2004). Locally common visitor to continental shelf waters from south-western Western Australia to south-eastern Queensland. Known to breed on 41 Islands primarily from the southern coast of WA, but also SE of the Eyre Peninsula (SPRAT) (e.g. Smith Island). No BDBSA records within 5 km. No suitable habitat within the CEA.
Recurvirostra novaehollandiae	Red-necked Avocet	LM		Known to use coastal habitats and inland habitats including intertidal mudflats, salt lakes, marshes, shallow inland water and sheltered bays and inlets (Simpson and Day 2004 and Geering et al. 2008). Two BDBSA records in the intertidal mudflats 2.4 km south of the CEA, the most recent from 2001. No suitable habitat within the CEA.
Rostratula australis	Australian Painted Snipe	EN, MW, LM	V	Known to use inland habitats including freshwater marshes with moderate cover and mudflats (Simpson and Day 2004, and Geering et al. 2008). No BDBSA records within 50 km of the CEA. No suitable habitat within the CEA.
Sterna fuscata	Sooty Tern	LM		Known to use coastal and ocean habitats including tropical and sub-tropical seas and associated islands (Simpson and Day). No BDBSA records within 50 km of the CEA. No suitable habitat within the CEA.
Sterna hirundo	Common Tern	LM, MM	R	Known to use coastal and ocean habitats including bays, coastlines, sandy beaches and sand spits (Simpson and Day 2004). Closest BDBSA record is 4.8 km south of CEA boundary, in the Port Lowly tidal flats. No suitable habitat within the CEA.
Sternula nereis nereis	Australian Fairy Tern	VU, LM	E	Known to use coastal and ocean habitats including estuaries, coastlines, sandy beaches and sand spits (Simpson and Day 2004). Closest BDBSA record is 19 km north-east of CEA boundary, close to Port Augusta. No suitable habitat within the CEA.
Stictonetta naevosa	Freckled Duck		V	Known to breed in heavily vegetated permanent fresh swamps, moving to fresh or salty permanent open lakes (Simpson and Day 2004). Two BDBSA records inside the CEA boundary, the most recent in a dam in 2001. Given that most records within the CEA were in dams and these will be decommissioned, individuals of this species are likely to be infrequent visitors to the CEA in the future.
Strepera versicolor ssp. plumbea	Grey Currawong (NW subspecies)	-	ssp. E	The listed sub species has a home range that extends from Western Australia into the north-west of South Australia and the south-west corner of the Northern Territory (Simpson and Day 2004). Subspecies recorded in BDBSA records and during the survey are more likely to be *Strepera versicolor ssp. intermedia*, which has known distribution over the CEA (Simpson and Day 2004) and does not have a rating under the NPW Act.
Thalassarche cauta cauta	Shy Albatross	VU, MM, LM	V	Endemic Australian species that occurs in subantarctic and subtropical waters. Species known to use southern Australian waters as far north as southern Queensland and as far west as Western Australia (Simpson and Day 2004, and SPRAT). Breeding colonies occur off Tasmania (Albatross Island, the Mewstone, Pedra Branca), most adults remain in the waters (SPRAT). No BDBSA records within 50 km of the CEA. Infrequent visitor to coastal EP. Highly mobile large bird. No critical habitat within the CEA.

Species Name	Common Name	EPBC Act[1]	SA NPW Act[2]	Why unlikely to occur?
Thalassarche cauta steadi	White-capped Albatross	VU, MM, LM		Commonly occurs off the coast of south-east Australia throughout the year. Similar to the Shy Albatross, this species breeds on off-shore islands near New Zealand (SPRAT). This species is marine in subantarctic and subtropical waters in South America (SPRAT). No BDBSA records within 50 km of the CEA. Infrequent visitor to coastal EP. Highly mobile large bird. No critical habitat within the CEA.
Thalassarche melanophris	Black-browed Albatross	VU, MM, LM	E	Breeds within the Australian jurisdiction on offshore islands. Individuals mostly utilise subantarctic and Antarctic waters surrounding these islands during the breeding season (SPRAT). Rarely sighted over land (SPRAT). No BDBSA records within 50 km of the CEA. Infrequent visitor to coastal EP. Highly mobile large bird. No critical habitat within the CEA.
Thalassarche melanophris impavida	Campbell Albatross	VU, MM, LM	V	Known as a marine sea bird that inhabits sub-Antarctic waters, this species breeds on the New Zealand offshore island of Campbell Island (SPRAT). Species are migratory, moving from the breeding colonies to continental shelf of southern Australia and New Zealand (SPRAT). No BDBSA records within 50 km of the CEA. Infrequent visitor to coastal EP. Highly mobile large bird. No critical habitat within the CEA.
Tringa stagnatilis	Marsh Sandpiper	MW, LM		Known to use coastal and inland fresh or saltwater wetlands, avoiding intertidal mudflats unless well protected (Geering et al. 2008). Two BDBSA records 2.4 km south of CEA boundary. No suitable habitat within the CEA.
Northiella haematogaster narethae	Blue bonnet (western subspecies)		R	SA NPW Act listed subspecies has a home range from western South Australia across the Nullabor, to the western Eyre Peninsula. The CEA is beyond the known limit of extent. BDBSA records do not specify which subspecies was recorded; but more likely to be *Northiella haematogaster haematogaster*, which does not have a state conservation rating, is dominant in the region (Simpsons and Day 2004) and was recorded during the 2014 EBCR survey.

[1] National *Environment Protection and Biodversity Conservation Act* 1999 (EPBC Act) status: Endangered (EN), Vulnerable (VU), Migratory Marine (MM);
[2] South Australian *National Parks and Wildlife Act 1974* (NPW Act) status: Endangered (E), Vulnerable (V), Rare (R),

Table J2: EPBC / NPW listed fauna species possible to occur.

Species Name	Common Name	EPBC Act[1]	NPW Act[2]	Why possible to occur?
Ardea ibis	Cattle Egret	MW, LM	R	Known to occupy pasture habitats, as well as floodwaters, wetlands and intertidal mudflats where it feeds on a variety of invertebrates, frogs and lizards (Simpson and Day 2004). Pasture habitats are known to be present within CEA and surrounding districts, although most are somewhat degraded due to weed invasion. It is possible that low-lying areas within the study area may hold water following heavy rain events however no permanent wetlands were observed within the CEA. Highly mobile species. Consequently, it is not expected that this species is reliant upon habitat features present within the study area, but may occur as a visitor. Two BDBSA records of this species from 1990 and 1994 are 7 km from the CEA boundary.
Egretta garzetta	Little Egret	MM, MW, LM		Known to use a wide range of wetland habitats; inland and coastal, freshwater and saline, permanent and ephemeral, open and vegetated, large and small, natural and artificial (Simpson and Day 2004). May retreat to permanent wetlands or costal environments during fluctuation of wet / dry seasons and with drought. May be present as a transient through the site, but not expected to be reliant upon the very small dams found on site. Not observed during the PER Survey.
Pandion haliaetus / cristatus	Osprey	LM	E	Previously, known as *Pandion haliaetus,* the taxonomy of this species is controversial (SPRAT 2013). Known to use coastal habitats, including elevated coastal cliffs exposed sites, sea stacks and elevated habitats (Simpson and Day 2004, Brandle 2010). Coastal habitat is present within the study area and although elevated habitats are preferred, they will use sandy or rocky shore habitats where elevated habitat or trees are unavailable. Consequently, the Eastern Osprey is vulnerable to human disturbance, particularly if breeding on the ground, rather than using elevated habitat (SPRAT, Caton et al. 2010). In particular, bio-accumulation of toxic substances through the consumption of affected prey as well as destruction of habitat, are considered major threats to this species (SPRAT).No BDBSA records occur within 50 km of the CEA. Previously a population has occurred at Spencer Gulf (Brandle 2010). The species is known to have a sparse distribution within SA including an estimated 52 breeding pairs, primarily located on the west coast of the Eyre Peninsula (Dennis 2004, 2007, cited in Brandle 2010).
Haliaeetus leucogaster	White-bellied Sea-eagle	MT, LM	E	Known to use many habitat types throughout Australia (Simpson and Day 2004). Preferred habitats characterised by presence of large areas of open water (larger rivers, swamps, lakes, the sea), but birds have been recorded in (or flying over) a variety of terrestrial habitats including those in semi-arid zones (Marchant and Higgins 1993). May be present as an overfly species to the study area, given distribution range and known presence on the nearby EP. However in the absence of preferred habitat (i.e. open water), it would not be expected to breed or spend significant time within the CEA.
Sminthopsis psammophila	Sandhill Dunnart	E	VU	Known from 3 significant populations (2 in SA, 1 in WA) (SPRAT, 2014). In SA, one population is known north west of Whyalla and populations have been studied near the SE Gawler Ranges and near Ceduna. Occupies sandy plains that support low woodland and low open woodland vegetation communities, also featuring diverse understorey and groundcover species (Parks and Wildlife Commission Northern Territory 2006). Prefers large, mature stands of Triodia in which to nest, forage and

				refuge. Key threats include clearance of habitat vegetation and disturbance of habitat by fire, resulting in the destruction of large, mature stands of vegetation (Parks and Wildlife Commission Northern Territory 2006). There are no BDBSA records within 20 km of the CEA, but records occur just outside this range to the south west of the CEA. Given the known range of existing population in the nearby reserve, and the lack of suitable habitat within the CEA, it is unlikely that the species occurs in the CEA. David Stemmer (SA Museum) considered it highly unlikely that this species would be present this far north. No suitable habitat within the CEA.
Falco peregrinus	Peregrine Falcon		R	This raptor inhabits most land types but prefers cliffs and rocky outcrops, and rocky coastal islands throughout Australia (Simpson and Day 2004). In South Australia this species has sparse distribution in woodlands (preferably near water), in gorges and coastal cliffs (Brandle 2010). Although the breeding range for this species does not include the Eyre Peninsula (Simpson and Day 2004), coastal cliffs in the EP region have been used for breeding (Dennis 2004 cited in Brandle 2010), as well as grain silos further inland (Brandle 2010). There are no BDBSA records within the study area for this species, but one record 4.6 km from the CEA (1991). Preferred habitat for this species does not occur within the study area, particularly breeding habitat, however it is possible they could occur as a visitor or pass through the area to preferred habitat. This species is highly mobile and it is unlikely that impacts to the species would occur and a result of the project.
Falco hypoleucos	Grey Falcon		R	Known to use a wide range of arid zone habitats including woodland sand scrub (Simpson and Day). Suitable habitat within CEA. One recent (1998) BDBSA record of this species 4.3 km south-west from the CEA boundary.

[1] National *Environment Protection and Biodversity Conservation Act* 1999 (EPBC Act) status: Endangered (EN), Vulnerable (VU), Migratory Marine (MM);
[2] South Australian *National Parks and Wildlife Act 1974 (*NPW Act) status: Endangered (E), Vulnerable (V), Rare (R),

Appendix K. Field results Flora

Table K1: Flora field survey

Species	Common Name	1	2	3	4	5	6	A	C	OPP	EPBC[1]	NPW[2]
**Asphodelus fistulosus*	Onion Weed				x							
**Carrichtera annua*	Ward's Weed	x	x		x	x	x	x				
**Carthamus lanatus*	Saffron Thistle	x				x	x					
**Centaurea melitensis*	Malta Thistle	x				x						
**Echium plantagineum*	Salvation Jane				x							
**Emex australis*	Three-corner Jack				x							
**Glinus lotoides*					x							
**Marrubium vulgare*	Horehound	x				x	x					
**Medicago minima*	Burr Medic				x	x						
**Mesembryanthemum crystallinum*	Common Iceplant											
**Salvia verbenaca*	Wild Sage				x	x						
**Sisymbrium orientale*	Indian Hedge Mustard		x		x	x						
**Sonchus oleraceus*	Common Sow-thistle	x			x							
Acacia burkittii	Pin-bush Wattle				**x**							
Acacia oswaldii	Umbrella Wattle			x	x	x						
Acacia papyrocarpa	Western Myall		x			x			x			
Alectryon oleifolius			x	x	x	x						
Amyema maidenii ssp. Maidenii			x									
Amyema miquelii	Box Mistletoe			x								
Amyema quandang var. quandang	Grey Mistletoe					x						
Angianthus tomentosus												
Atriplex angulata	Fan Saltbush	x										
Atriplex stipitata	Bitter Saltbush			x								

Species	Common Name	1	2	3	4	5	6	A	C	OPP	EPBC[1]	NPW[2]
Atriplex vesicaria	Bladder Saltbush	x	x	x	x	x	x	x	x			
Austrostipa elegantissima	Feather Spear-grass	x		x		x						
Austrostipa platychaeta	Flat-awn Spear-grass			x	x	x			x			
Austrostipa scabra ssp. scabra	Rough Spear-grass		x	x	x			x				
Calotis erinacea				x								
Carpobrotus rossii (NC)	Native Pigface											
Casuarina pauper	Black Oak		x									
Chenopodium curvispicatum	Cottony Goosefoot		x		x	x			x			
Chenopodium desertorum ssp. desertorum	Frosted Goosefoot			x		x						
Chloris pectinata		x										
Convolvulus remotus	Grassy Bindweed				x	x						
Craspedia haplorrhiza							x					
Cratystylis conocephala	Bluebush Daisy								x			
Daucus glochidiatus	Native Carrot						x					
Dianella revoluta var. revoluta	Black-anther Flax-lily			x								
Dissocarpus biflorus var. biflorus	Two-horn Saltbush	x					x					
Dissocarpus paradoxus	Ball Bindyi		x			x						
Dodonaea viscosa ssp. angustissima	Narrow-leaf Hop-bush			x								
Einadia nutans		x				x						
Enchylaena tomentosa var.	Ruby Saltbush	x	x	x	x	x		x				
Eragrostis dielsii		x										
Eremophila deserti	Turkey-bush	x			x							
Eremophila glabra ssp. glabra	Tar Bush			x	x			x				
Eremophila longifolia	Weeping Emubush	x			x	x						
Eremophila scoparia	Broom Emubush				x	x	x		x			
Eriochiton sclerolaenoides	Woolly-fruit Bluebush					x						
Eucalyptus gracilis	Yorrell			x					x			

Species	Common Name	1	2	3	4	5	6	A	C	OPP	EPBC[1]	NPW[2]
Eucalyptus oleosa (NC)	Red Mallee			x					x			
Eucalyptus socialis (NC)	Beaked Red Mallee			x								
Exocarpos aphyllus	Leafless Cherry			x	x	x			x			
Frankenia pauciflora												
Frankenia serpyllifolia	Thyme Sea-heath						x					
Geijera linearifolia	Sheep Bush			x				x	x			
Goodenia fascicularis		x										
Lawrencia glomerata	Clustered Lawrencia											
Lemooria burkittii	Wires-and-wool	x			x							
Lycium australe	Australian Boxthorn			x	x	x	x		x			
Lysiana exocarpi ssp. exocarpi	Harlequin Mistletoe	x	x		x	x						
Maireana brevifolia	Short-leaf Bluebush	x										
Maireana erioclada	Rosy Bluebush		x						x			
Maireana georgei	Satiny Bluebush			x	x	x		x	x			
Maireana pentatropis	Erect Mallee Bluebush			x					x			
Maireana pyramidata	Black Bluebush		x		x	x	x					
Maireana sedifolia	Bluebush		x	x	x	x	x	x	x			
Marsilea drummondii	Common Nardoo	x										
Melaleuca lanceolata	Dryland Tea-tree			x								
Melaleuca pauperiflora	Borree							x				
Minuria cunninghamii	Bush Minuria					x	x					
Muehlenbeckia florulenta		x										
Myoporum platycarpum	False Sandalwood		x	x		x	x					
Olearia muelleri	Mueller's Daisy-bush			x								
Olearia pimeleoides	Pimelea Daisy-bush						x					
Osteocarpum acropterum var. acropterum	Tuberculate Bonefruit											
Oxalis perennans	Native Sorrel	x			x							

Species	Common Name	1	2	3	4	5	6	A	C	OPP	EPBC[1]	NPW[2]
Pittosporum angustifolium	Native Apricot			x		x		x	x			
Plantago drummondii	Dark Plantain						x					
Ptilotus obovatus					x			x	x			
Rhagodia crassifolia	Fleshy Saltbush								x			
Rhagodia parabolica	Mealy Saltbush			x								
Rhagodia spinescens	Spiny Saltbush	x		x	x	x	x					
Rhagodia ulicina	Intricate Saltbush		x	x		x		x	x			
Rhodanthe polygalifolia	Milkwort Everlasting						x					
Rhodanthe pygmaea	Pigmy Daisy						x					
Rhodanthe stricta	Slender Everlasting	x				x	x					
Rytidosperma setaceum		x	x		x	x	x	x				
Salsola australis	Buckbush		x									
Santalum acuminatum	Quandong				x	x						
Santalum spicatum	Sandalwood									x		V
Scaevola spinescens	Spiny Fanflower				x							
Sclerolaena brachyptera	Short-wing Bindyi						x					
Sclerolaena diacantha	Grey Bindyi								x			
Sclerolaena obliquicuspis	Oblique-spined Bindyi	x	x			x	x					
Sclerolaena uniflora	Small-spine Bindyi			x			x					
Senecio lautus												
Senecio quadridentatus	Cotton Groundsel					x						
Senna artemisioides ssp. Alicia							x					
Senna artemisioides ssp. coriacea			x		x	x			x			
Senna artemisioides ssp. filifolia	Fine-leaf Desert Senna							x				
Senna artemisioides ssp. petiolaris			x	x								
Senna artemisioides ssp. X coriacea	Broad-leaf Desert Senna	x		x	x							
Setaria constricta	Knotty-butt Paspalidium				x							

Species	Common Name	1	2	3	4	5	6	A	C	OPP	EPBC[1]	NPW[2]
Solanum coactiliferum	Tomato-bush			x								
Solanum ellipticum	Velvet Potato-bush					x		x				
Solanum petrophilum	Rock Nightshade							x				
Stellaria angustifolia		x										
Tagetes minuta		x										
Tecticornia pergranulata												
Tecticornia tenuis										x		
Templetonia egena	Broombush Templetonia		x			x		x				
Teucrium racemosum		x										
Threlkeldia diffusa	Coast Bonefruit			x								
Thysanotus baueri	Mallee Fringe-lily						x					
Trichanthodium skirrophorum	Woolly Yellow-heads					x	x					
Triodia scariosa	Spinifex							x				
Vittadinia gracilis	Woolly New Holland Daisy					x	x					
Westringia rigida	Stiff Westringia			x				x				
Zaleya galericulata						x						
Zygophyllum apiculatum	Pointed Twinleaf			x								
Zygophyllum aurantiacum ssp.									x			
Zygophyllum eremaeum				x								
Zygophyllum ovatum	Dwarf Twinleaf					x						

[1] National *Environment Protection and Biodversity Conservation Act* 1999 (EPBC Act) status: Endangered (EN), Vulnerable (VU), Migratory Marine (MM);

[2] South Australian *National Parks and Wildlife Act 1974* (NPW Act) status: Endangered (E), Vulnerable (V), Rare (R),

Appendix L. Field results Fauna

Table L1: CEA Flora and Fauna Survey: Birds Recorded by Site

Species Name	Common Name	1	2	3	4	5	6	Opp[1] / Spot	EPBC[2]	NPW[3]
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	x	x	x	x	x	x			
Acanthiza apicalis	Inland Thornbill		x			x		Near S3		
Acanthiza chrysorrhoa	Yellow-rumped Thornbill			x		x				
Acanthiza iredalei iredalei SA: R	Slender-billed Thornbill (western ssp)			x						R
Acanthiza uropygialis	Chestnut-rumped Thornbill	x	x	x		x	x	x		
Accipiter cirrocephalus	Collared Sparrowhawk			x						
Aegotheles cristatus	Australian Owlet-nightjar		x							
Amytornis textilis myall	Western (Gawler Ranges) Grasswren	x				x			VU	
Anas gracilis	Grey Teal							Near S3 (744078 637166)		
Anthochaera carunculata	Red Wattlebird			x	x	x				
Anthus australis	Australian Pipit				x					
Aphelocephala leucopsis	Southern Whiteface	x	x			x		Near S3		
Aquila audax	Wedge-tailed Eagle			x				Near S3 (nest)		
Artamus cyanopterus	Dusky Woodswallow			x				Iron Knob Rd		
Artamus personatus	Masked Woodswallow				x			Track to S1, track to S4		
Barnardius zonarius	Australian Ringneck	x	x	x	x	x				
Chalcites basalis	Horsfield's Bronze Cuckoo			x		x				
Chalcites osculans	Black-eared Cuckoo		x			x				

Colluricincla harmonica	Grey Shrikethrush		x	x	x	x				
Coracina maxima	Ground Cuckooshrike				x					
Coracina novaehollandiae	Black-faced Cuckooshrike		x	x			x	Track to S6, near site 1		
Corvus coronoides	Australian Raven		x		x	x	x			
Corvus mellori	Little Raven		x				x			
Coturnix pectoralis	Stubble Quail		x		x					
Cracticus torquatus	Grey Butcherbird		x	x	x		x			
Dromaius novaehollandiae	Emu	x		x	x		x	Plains near NE corner track to S3 with young		
Eolophus roseicapilla	Galah			x	x	x				
Falco berigora	Brown Falcon							Track to S5		
Falco cenchroides	Nankeen Kestrel		x					Near S3		
Gavicalis virescens	Singing Honeyeater	x	x	x	x	x	x			
Gymnorhina tibicen	Australian Magpie	x	x	x		x	x	track to S3		
Hirundo neoxena	Welcome Swallow							MS		
Lalage tricolor	White-winged Triller		x					Near S6		
Malurus lamberti	Variegated Fairy-wren	x		x	x	x	x			
Malurus leucopterus	White-winged Fairy-wren	x	x		x		x	Near S3, track to S6		
Malurus splendens	Splendid Fairy-wren	x	x	x	x	x	x			
Manorina flavigula	Yellow-throated Miner	x			x					
Melithreptus brevirostris	Brown-headed Honeyeater					x				
Microcarbo melanoleucos	Little Pied Cormorant							Near S3 (744078 637166)		
Microeca fascinans assimilis	Jacky Winter		x	x	x	x				ssp
Milvus migrans	Black Kite							BC		

Myiagra inquieta	Restless Flycatcher				x					
Northiella haematogaster haematogaster	Bluebonnet					x				ssp
Ocyphaps lophotes	Crested Pigeon	x	x		x	x		Near S1		
Oreoica gutturalis	Crested Bellbird				x	x	x			
Pachycephala inornata	Gilbert's Whistler		x		x					R
Pachycephala rufiventris	Rufous Whistler		x					Track to S3		
Pardalotus punctatus	Spotted Pardalote			x						
Pardalotus striatus	Striated Pardalote			x						
Petrochelidon nigricans	Tree Martin				x					
Petroica goodenovii	Red-capped Robin			x						
Phaps chalcoptera	Common Bronzewing				x			Near S1		
Podargus strigoides	Tawny Frogmouth			x			x	Near S3		
Pomatostomus superciliosus	White-browed Babbler		x	x	x	x	x			
Psephotus haematonotus	Red-rumped parrot					x				
Psephotus varius	Mulga Parrot		x		x	x				
Purnella albifrons	White-fronted Honeyeater			x	x					
Pyrrholaemus brunneus	Redthroat	x				x				
Rhipidura leucophrys	Willie Wagtail					x		track to S3		
Smicrornis brevirostris	Weebill			x						
Strepera versicolor intermedia	Grey Currawong			x						ssp
Tribonyx ventralis	Black-tailed Native Hen							Near S3 (744078 637166)		
Total		**14**	**25**	**28**	**27**	**27**	**15**	**23**		

[1]Opportunistic / Spotlighting, MS = Middleback Field Station, S3 = site 3,

[2] *Environment Protection and Biodiversity Conservation Act* 1999 Status: Endangered (EN), Vulnerable (VU), Migratory (MI), Marine (MA), Extinct (EX);

[3] South Australian National Parks and Wildlife Act 1972 (NPWA) Status: Endangered (E), Vulnerable (V), Rare (R);

*Introduced species. Ssp = conservation status relates to particular subspecies only, see Section 6 for discussion.

Table L2: CEA Flora and Fauna Survey: Reptiles recorded by site

Species	Common Name	1	2	3	4	5	6	Opportunistic[1]
Cryptoblepharus australis	Desert Wall Skink			x				
Ctenophorus cristatus	Crested Dragon			x				
Ctenophorus pictus	Painted Dragon		x				x	
Ctenotus olympicus	Saltbush Ctenotus		x		x	x	x	
Ctenotus schomburgkii	Sandplain Ctenotus		x	x		x		Flora site C
Diplodactylus furcosus	Ranges Stone Gecko				x		x	
Eremiascincus richardsonii	Broad-banded sand swimmer		x			x	x	
Gehyra variegata	Tree Dtella		x			x		
Heteronotia binoei	Bynoe's Gecko							Near Communications tower
Lerista edwardsae	Myall Slider			x		x	x	
Pogona vitticeps	Central Bearded Dragon				x			
Pseudechis australis	Mulga Snake	x						Near Flora and Fauna Site 1
Rhynchoedura ornata	Beaked Gecko		x					
Strophurus intermedius	Southern Spiny-tailed Gecko		x			x		Middleback Field Station
Tiliqua rugosa	Sleepy Lizard	x			x	x		Vouchered from rocky outcrop, track to Flora and Fauna site 3, track to Flora and Fauna site 4 (3)
Morethia adelaidensis	Saltbush Morethia Skink						x	
Varanus gouldii	Sand Goanna							Middleback Field Station Driveway, Iron Knob Rd near Flora and Fauna site 6, Iron Baron to Iron Knob Rd

Pogona barbarta	Bearded Dragon				x			
Total		**2**	**7**	**4**	**5**	**7**	**6**	**5**

Table L3: CEA Flora and Fauna Survey: Mammals observed by site

Species	**Common Name**	**1**	**2**	**3**	**4**	**5**	**6**	**Opportunistic**
**Capra hircus*	Goat (Feral Goat)						SC	Communications Tower
**Felis catus*	Domestic Cat (Feral Cat)						TR	
**Mus musculus*	House Mouse	x		x	x	x	x	
**Oryctolagus cuniculus*	Rabbit (European Rabbit)		DI			x		Middleback Field Station, communications tower
**Vulpes vulpes*	Fox (Red Fox)							Iron Knob to Whyalla Rd
Austronomus australis	White-striped free-tailed bat			x				
Chalinolobus gouldii	Gould's Wattled Bat	x	x	x	x	*x*[2]	x	
Macropus fuliginosus	Western Grey Kangaroo		x				SC	Near FF3, FF5 track, FF3 track with young
Macropus rufus	Red Kangaroo							Near FF3
Mormopterus species 3 or 4	Inland Free-tailed Bat	*x*[2]	x	x	x	*x*[2]	x	
Nyctophilus geoffroyi or major	Lesser or Central Long-eared Bat	x	x	x	x	x	x	
Pseudomys bolami	Bolam's mouse					x	x	
Sminthopsis dolichura	Little long tailed Dunnart					x		
Vespadelus baverstocki	Inland Forest Bat	x	x	x		*x*[1]		
Vespadelus regulus	Southern Forest Bat	x		*x*[1]		*x*[1]		
	Total[3]	**5 or 6**	**6**	**7 or 8**	**4**	**5-9**	**8**	**5**

*Introduced species

FF1-FF6 (Flora and fauna site 1 to 6); TR = track evidence, SC = scat, DI = diggings;, SP = observed and / or heard w hilst spotlighting. Some bats calls could not be identified to genus level and have been removed from the total species count; calls confirmed by Dennis Mathew s, these calls w ere

[1] *Nyctophilus sp. or Vespadelus sp.,*

[2] *Chalinolobus gouldii or Mormopterus sp3 or 4;*

[3] Numbers vary as bat species could have been higher if both species occur.

Appendix M. Total Fauna List in CEA

Table M1: CEA total fauna list: Birds

Species	Common Name	BDBSA	PER	Jacobs	EPBC[1]	NPW[2]
Amytornis textilis myall	Thick-billed (Western/Gawler Ranges) Grasswren	x	x	x	VU	R
Anas rhynchotis	Australasian Shoveler		x			R
Pachycephala inornata SA: R	Gilbert's Whistler	x	x	x		R
Cacatua leadbeateri SA: R	Major Mitchell's Cockatoo	x	x			R
Acanthiza iredalei iredalei SA: R	Slender-billed Thornbill (western ssp)	x	x	x		R
Climacteris affinis	White-browed Treecreeper		x			R
Northiella haematogaster SA: ssp	Bluebonnet	x	x	x		ssp.
Cinclosoma castanotum SA: ssp	Chestnut-backed Quailthrush (Chestnut Quailthrush)	x	x			ssp.
Strepera versicolor SA: ssp	Grey Currawong	x	x	x		ssp.
Melanodryas cucullata SA: ssp	Hooded Robin	x	x			ssp.
Microeca fascinans SA: ssp	Jacky Winter	x	x	x		ssp.
Tachybaptus novaehollandiae	Australasian Grebe	x	x			
Gymnorhina tibicen	Australian Magpie	x	x	x		
Aegotheles cristatus	Australian Owlet-nightjar	x		x		
Anthus australis	Australian Pipit	x	x	x		
Corvus coronoides	Australian Raven	x	x	x		
Barnardius zonarius	Australian Ringneck	x	x	x		
Vanellus tricolor	Banded Lapwing	x	x			
Cygnus atratus	Black Swan	x	x			
Chalcites osculans	Black-eared Cuckoo	x	x	x		
Coracina novaehollandiae	Black-faced Cuckooshrike	x	x	x		
Artamus cinereus	Black-faced Woodswallow	x	x			
Elseyornis melanops	Black-fronted Dotterel	x	x			
Milvus migrans	Black Kite	x		x		
Elanus axillaris	Black-shouldered Kite	x	x			
Tribonyx ventralis	Black-tailed Nativehen	x	x	x		

Himantopus himantopus	Black-winged Stilt		x			
Falco berigora	Brown Falcon	x	x	x		
Accipiter fasciatus	Brown Goshawk		x			
Cincloramphus cruralis	Brown Songlark	x	x			
Melithreptus brevirostris	Brown-headed honeyeater	x		x		
Melopsittacus undulatus	Budgerigar	x	x			
Acanthiza uropygialis	Chestnut-rumped Thornbill	x	x	x		
Psophodes cristatus	Chirruping Wedgebill	x	x			
Nymphicus hollandicus	Cockatiel	x	x			
Accipiter cirrocephalus	Collared Sparrowhawk	x	x	x		
Phaps chalcoptera	Common Bronzewing	x	x	x		
*Sturnus vulgaris**	Common Starling	x	x			
Oreoica gutturalis	Crested Bellbird	x	x	x		
Ocyphaps lophotes	Crested Pigeon	x	x	x		
Epthianura tricolor	Crimson Chat	x	x			
Artamus cyanopterus	Dusky Woodswallow	x	x	x		
Dromaius novaehollandiae	Emu	x	x	x		
Fulica atra	Eurasian Coot	x	x			
Petrochelidon ariel	Fairy Martin	x	x			
Eolophus roseicapilla	Galah	x	x	x		
Cracticus torquatus	Grey Butcherbird	x	x	x		
Colluricincla harmonica	Grey Shrikethrush	x	x	x		
Anas gracilis	Grey Teal	x	x	x		
Coracina maxima	Ground Cuckooshrike	x		x		
Aythya australis	Hardhead	x	x			
Chalcites basalis	Horsfield's Bronze Cuckoo	x	x	x		
Acanthiza apicalis	Inland Thornbill	x	x	x		
Turnix velox	Little Buttonquail	x	x			
Megalurus gramineus	Little Grassbird		x			

Microcarbo melanoleucos	Little Pied Cormorant	x		x		
Corvus mellori	Little Raven	x	x	x		
Grallina cyanoleuca	Magpielark	x	x			
Chenonetta jubata	Maned (Australian Wood Duck)	x	x			
Vanellus miles	Masked Lapwing	x	x			
Artamus personatus	Masked Woodswallow	x		x		
Dicaeum hirundinaceum	Mistletoebird	x	x			
Psephotus varius	Mulga Parrot	x	x	x		
Falco cenchroides	Nankeen Kestrel	x	x	x		
Anas superciliosa	Pacific Black Duck	x	x			
Cacomantis pallidus	Pallid Cuckoo	x	x			
Malacorhynchus membranaceus	Pink-eared duck	x	x			
Anthochaera carunculata	Red Wattlebird	x	x	x		
Todiramphus pyrrhopygius	Red-backed Kingfisher	x	x			
Petroica goodenovii	Red-capped Robin	x	x	x		
Erythrogonys cinctus	Red-kneed Dotterel	x	x			
Psephotus haematonotus	Red-rumped parrot			x		
Pyrrholaemus brunneus	Redthroat	x	x	x		
Myiagra inquieta	Restless Flycatcher			x		
Calamanthus (Calamanthus) campestris	Rufous Fieldwren	x	x			
Cincloramphus mathewsi	Rufous Songlark	x	x			
Pachycephala rufiventris	Rufous Whistler	x	x	x		
Gavicalis virescens	Singing Honeyeater	x	x	x		
Aphelocephala leucopsis	Southern Whiteface	x	x	x		
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	x	x	x		
Malurus splendens	Splendid Fairywren	x	x	x		
Spotted Harrier	Spotted Harrier	x	x			
Pardalotus punctatus	Spotted Pardalote	x		x		
Pardalotus striatus	Striated Pardalote	x	x	x		

Coturnix pectoralis	Stubble Quail	x	x	x		
Podargus strigoides	Tawny Frogmouth		x	x		
Petrochelidon nigricans	Tree Martin	x	x	x		
Daphoenositta chrysoptera	Varied Sittella	x	x			
Malurus lamberti	Variegated Fairywren	x	x	x		
Aquila audax	Wedge-tailed Eagle	x	x	x		
Smicrornis brevirostris	Weebill	x	x	x		
Hirundo neoxena	Welcome Swallow	x	x	x		
Cheramoeca leucosterna	White-backed Swallow	x	x			
Pomatostomus superciliosus	White-browed Babbler	x	x	x		
Artamus superciliosus	White-browed Woodswallow	x	x			
Egretta novaehollandiae	White-faced Heron	x	x			
Epthianura albifrons	White-fronted Chat	x	x			
Purnella albifrons	White-fronted Honeyeater	x	x	x		
Malurus leucopterus	White-winged Fairywren	x	x	x		
Lalage tricolor	White-winged Triller	x	x	x		
Rhipidura leucophrys	Willie Wagtail	x	x	x		
Lichenostomus ornatus	Yellow-plumed honeyeater	x	x			
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	x	x	x		
Manorina flavigula	Yellow-throated Miner	x	x	x		

[1] National *Environment Protection and Biodversity Conservation Act* 1999 (EPBC Act) status: Endangered (EN), Vulnerable (VU), Migratory Marine (MM);
[2] South Australian *National Parks and Wildlife Act 1974 (*NPW Act) status: Endangered (E), Vulnerable (V), Rare (R),

Table M2: CEA total fauna list: Reptiles

Species	Common Name	BDBSA	PER	Jacobs	EPBC[1]	NPW[2]
Cryptoblepharus australis	Desert Wall Skink	x		x		
Ctenophorus cristatus	Crested Dragon	x		x		
Ctenophorus pictus	Painted Dragon	x		x		
Ctenophorus fionni	Peninsula Dragon	x	x			
Ctenotus olympicus	Saltbush Ctenotus	x		x		

Ctenotus schomburgkii	Sandplain Ctenotus	x		x		
Diplodactylus furcosus	Ranges Stone Gecko	x		x		
Eremiascincus richardsonii	Broad-banded sand swimmer			x		
Gehyra variegata	Tree Dtella	x		x		
Heteronotia binoei	Bynoe's Gecko	x		x		
Lerista edwardsae	Myall Slider	x		x		
Lucasium damaeum	Beaded Gecko	x	x			
Pogona vitticeps	Central Bearded Dragon	x	x	x		
Pseudechis australis	Mulga Snake	x		x		
Rhynchoedura ornata	Beaked Gecko			x		
Strophurus elderi	Jewelled Gecko			x		
Strophurus intermedius	Southern Spiny-tailed Gecko	x		x		
Tiliqua rugosa	Sleepy Lizard	x	x	x		
Tiliqua scincoides	Common Blue-Tongue		x			
Varanus gouldii	Sand Goanna	x		x		
Morethia adelaidensis	Saltbush Morethia Skink			x		
Pogona barbarta	Bearded Dragon			x		

[1] National *Environment Protection and Biodversity Conservation Act* 1999 (EPBC Act) status: Endangered (EN), Vulnerable (VU), Migratory Marine (MM);
[2] South Australian *National Parks and Wildlife Act 1974 (*NPW Act) status: Endangered (E), Vulnerable (V), Rare (R),

Table M3: CEA total fauna list: Mammals

Species	Common Name	BDBSA	PER	Jacobs	EPBC[1]	NPW[2]
**Capra hircus*	Goat (Feral Goat)	x	x	x		
**Felis catus*	Domestic Cat (Feral Cat)	x		x		
**Mus musculus*	House Mouse	x		x		
**Oryctolagus cuniculus*	Rabbit (European Rabbit)	x	x	x		
**Vulpes vulpes*	Fox (Red Fox)	x	x	x		
Chalinolobus gouldii	Gould's Wattled Bat	x		x		
Macropus fuliginosus	Western Grey Kangaroo	x	x	x		
Macropus rufus	Red Kangaroo	x	x	x		
Mormopterus species 3 or 4	Inland Free-tailed Bat	x		x		
Nyctophilus geoffroyi/major	Lesser Long-eared Bat	x		x		
Nyctophilus sp./Vespadelus sp.				x		
Vespadelus baverstocki	Inland Forest Bat	x		x		
Vespadelus sp.				x		

Austronomus australis	White-striped freetail Bat			x		
**Ovis aries*	Sheep		x	x		
Chalinolobus gouldii / *Mormopterus* sp3 or 4				x		
Vespadelus regulus	Southern Forest Bat			x		
Sminthopsis dolichura	Little long tailed Dunnart			x		
Pseudomys bolami	Bolam's mouse			x		

[1] National *Environment Protection and Biodversity Conservation Act* 1999 (EPBC Act) status: Endangered (EN), Vulnerable (VU), Migratory Marine (MM);

[2] South Australian *National Parks and Wildlife Act 1974 (*NPW Act) status: Endangered (E), Vulnerable (V), Rare (R),

Appendix N. Full list of Flora within the CEA

Species	Common Name	BDBSA	PER	Jacobs	Status
**Acetosa vesicaria*	Rosy Dock	x	x		
**Alyssum linifolium*	Flax-leaved alyssum	x	x		
**Anagallis arvensis*	Pimpernel	x	x		
**Asphodelus fistulosus*	Onion Weed	x	x	x	Not a Declared weed but is a policy
**Brassica tournefortii*	Mediterranean turnip		x		
**Bromus rubens*	Red Brome	x	x		
**Carrichtera annua*	Ward's Weed	x	x	x	
**Carthamus lanatus*	Saffron Thistle	x	x	x	Not a Declared weed but is a policy
**Centaurea melitensis*	Malta Thistle	x		x	
**Chenopodium album*	White goosefoot		x		
**Cleretum papulosum*			x		
**Cylindropuntia imbricata*	Devils rope	x	x		WoNS
**Diplotaxis muralis*	Wall rocket		x		
**Dittrichia graveolens*	Stinkwort	x	x		
**Echium plantagineum*	Salvation Jane	x	x	x	Declared weed
**Emex australis*	Three-corner Jack	x	x	x	Declared weed
**Erodium cicutarium*	Common storks bill	x	x		
**Glinus lotoides*	Hairy carpet-weed			x	
**Helichryum luteoalbum*	Everlasting		x		
**Hordeum leporinum*	Barley-grass		x		
**Hypochaeris glabra*	Smooth catsear		x		
**Lactuca serriola*	Milk thistle		x		
**Lamarckia aurea*	Golden-top		x		
**Leontodon rhagadioloides*	Cretan weed		x		
**Limonium lobatum*	Winged sea-lavender	x	x		
**Lycium ferrocissimum*	African boxthorn	x	x		Declared weed and WoNS
**Malva parviflora*	Small-flowered marshmallow	x	x		
**Marrubium vulgare*	Horehound	x	x	x	Declared weed
**Medicago arabica*	Spotted Medic		x		
**Medicago minima*	Burr Medic	x		x	
**Mesembryanthemum nodiflorum*	Slender iceplant	x	x		
**Nicotiana glauca*	Tree tobacco	x	x		
**Pentaschistis airoides*	False hair-grass		x		
**Plantago sp.*			x		
**Romulea rosea*	Onion weed		x		
**Rostraria pumila*	Tiny bristle-grass	x	x		

Species	Common Name	BDBSA	PER	Jacobs	Status
**Rumex sp.*			x		
**Salvia verbenaca*	Wild Sage	x	x	x	
**Schismus barbatus*		x	x		
**Sclerobltum atriplicinum*	Purple goosefoot		x		
**Sisymbrium erysimoides*		x	x		
**Sisymbrium irio*	London Rocket	x	x		
**Sisymbrium orientale*	Indian Hedge Mustard			x	
**Sisymbrium sp.*			x		
**Sonchus oleraceus*	Common Sow-thistle	x	x	x	
**Sonchus sp.*			x		
**Spergularia diandra*	Lesser sand-spurrey	x	x		
**Xanthium spinosum*	Bathurst burr	x	x		Declared weed
**Zaluzianskya divaricata*	Spreading night-phlox		x		
Abutilon halophilum	Plains lantern flower		x		
Abutilon leucopetalum	Desert chinese-lantern		x		
Abutilon sp.	Lantern flowers		x		
Acacia aneura	Mulga	x	x		
Acacia beckleri	Barrier Range wattle		x		
Acacia burkittii	Pin-bush Wattle	x	x	x	
Acacia calamifolia	Wallowa	x	x		
Acacia iteaphylla	Flinders Ranges Wattle		x		SA NPW: Rare
Acacia microcarpa	Manna wattle		x		
Acacia notabilis	Notable wattle		x		
Acacia oswaldii	Umbrella Wattle	x	x	x	
Acacia papyrocarpa	Western Myall	x	x	x	
Acacia rigens	Nealie		x		
Acacia salicina	Broughton willow		x		
Acacia victoriae	Elegant wattle	x	x		
Actinobole uliginosum	Flannel cudweed	x	x		
Alectryon oleifolius	Bullock-bush		x	x	
Alectryon oleifolius subsp. canescens	Bullock-bush		x		
Amyema maidenii ssp. Maidenii	Pale-leafed mistletoe			x	
Amyema miquelii	Box Mistletoe	x		x	
Amyema quandang var. quandang	Grey Mistletoe	x	x	x	
Angianthus brachypappus	Spreading cup-flower		x		
Angianthus tomentosus	Hairy cup-flower		x	x	
Anthosachne scabra	Common wheat-grass		x		

Species	Common Name	BDBSA	PER	Jacobs	Status
Arabidella nasturtium	Yellow cress	x	x		
Arabidella sp.			x		
Arabidella trisecta	Shrubby cress	x	x		
Aristida contorta	Mulga grass	x	x		
Arthropodium minus	Small vanilla-lily	x	x		
Asperula conferta	Common woodruff	x	x		
Asteraceae sp.	Daisy		x		
Atriplex angulata	Fan Saltbush	x		x	
Atriplex holocarpa	Pop saltbush	x	x		
Atriplex spongiosa	Pop saltbush		x		
Atriplex stipitata	Bitter Saltbush	x		x	
Atriplex vesicaria	Bladder Saltbush	x	x	x	
Austrostipa elegantissima	Feather Spear-grass	x	x	x	
Austrostipa eremophila	Desert spear-grass	x	x		
Austrostipa lanata			x		
Austrostipa nitida	Balcarra grass	x	x		
Austrostipa platychaeta	Flat-awn Spear-grass	x		x	
Austrostipa puberula			x		
Austrostipa scabra			x		
Austrostipa scabra ssp. scabra	Rough Spear-grass	x	x	x	
Austrostipa scabra subsp. falcata			x		
Brachyscome ciliaris	Variable daisy		x		
Brachyscome dichromosomatica var. dichromosomatica		x	x		
Brachyscome lineariloba	Hardheaded daisy	x	x		
Brachyscome sp.			x		
Brachyscome trachycarpa	Smooth daisy		x		
Bulbine semibarbata	Leek lily	x	x		
Bromus sp.			x		
Calandrinia eremaea	Small purslane	x	x		
Calandrinia sp.			x		
Callitris glaucophylla	Murray pine	x	x		
Calocephalus platycephalus	Billybuttons		x		
Calotis cymbacantha	Showy burr-daisy	x	x		
Calotis erinacea	Tangled burr-daisy			x	
Calotis hispidula	Bogan flea	x	x		
Calotis latiuscula	Leafy burr-daisy		x		
Cassinia laevis	Cough bush	x	x		
Casuarina pauper	Black Oak	x		x	
Centipeda thespidioides	Desert sneezeweed	x	x		
Chamaesyce drummondii	Flat spurge	x	x		

Species	Common Name	BDBSA	PER	Jacobs	Status
Cheilanthes lasiophylla	Wooly cloak-fern	x	x		
Cheilanthes sieberi sub sp. sieberi		x	x		
Chenopodium curvispicatum	Cottony Goosefoot	x		x	
Chenopodium desertorum ssp. desertorum	Frosted Goosefoot	x		x	
Chloris pectinata	Comb windmill grass		x	x	
Chrysocephalum apiculatum	Common everlasting	x	x		
Chrysocephalum eremaeum			x		
Chthonocephalus pseudevax	Ground-heads	x	x		
Convolvulus clementii	Australian bindweed		x		
Convolvulus remotus	Grassy Bindweed	x	x	x	
Convolvulus sp.			x		
Craspedia haplorrhiza	Bachelors buttons			x	
Crassula colorata	Dense crassula	x	x		
Crassula sp.	Crassula		x		
Crassula tetramera	Crassula		x		
Cratystylis conocephala	Bluebush Daisy	x		x	
Cryptandra sp. Floriferous	Bitter cryptandra	x	x		
Cymbopogon ambiguus	Scented grass		x		
Cynoglossum australe	Australian hounds tongue		x		
Daucus glochidiatus	Native Carrot	x	x	x	
Daviesia ulicifolia	Gorse bitter-pea		x		
Dianella revoluta	Black-anther Flax-lily		x		
Dianella revoluta var. revoluta	Black-anther Flax-lily	x	x	x	
Dissocarpus biflorus	Two-horn Saltbush		x		
Dissocarpus biflorus var. biflorus	Two-horn Saltbush	x	x	x	
Dissocarpus paradoxus	Ball Bindyi	x	x	x	
Dodonaea lobulata	Lobed hop-bush	x	x		
Dodonaea sp.	Hop-bush		x		
Dodonaea viscosa	Sticky hop-bush		x		
Dodonaea viscosa ssp. angustissima	Narrow-leaf Hop-bush	x	x	x	
Einadia nutans	Nodding saltbush		x	x	
Elachanthus pusillus	Elachanth	x	x		
Enchylaena tomentosa	Ruby Saltbush	x	x		
Enchylaena tomentosa var.	Ruby Saltbush	x	x	x	
Enneapogon caerulescens			x		
Eragrostis dielsii	Mulka grass			x	
Eremophila alternifolia	Narrow-leaved fuchsia-bush	x	x		
Eremophila deserti	Turkey-bush	x	x	x	

Species	Common Name	BDBSA	PER	Jacobs	Status
Eremophila duttonii	Budda	x	x		
Eremophila glabra	Tar bush	x	x		
Eremophila glabra ssp. glabra	Tar Bush	x		x	
Eremophila latrobei	Crimson turkey-bush		x		
Eremophila longifolia	Weeping Emubush	x	x	x	
Eremophila maculata			x		
Eremophila oppositifolia		x	x		
Eremophila scoparia	Broom Emubush	x		x	
Eremophila serrulata	Green fuchsia-bush	x	x		
Eremophila sp.	Emubush		x		
Eriochiton sclerolaenoides	Woolly-fruit Bluebush	x	x	x	
Eriochlamys behrii	Wooly mantle	x	x		
Erodiophyllum elderi	Koonamore daisy	x	x		
Erodium carolinianum			x		
Erodium crinitum	Blue storks bill	x	x		
Erodium cygnorum			x		
Erodium sp.	Storks bill		x		
Eucalyptus brachycalyx	Gilja	x	x		
Eucalyptus dumosa	White Mallee		x		
Eucalyptus gracilis	Yorrell	x		x	
Eucalyptus oleosa	Red Mallee	x	x	x	
Eucalyptus socialis	Beaked Red Mallee	x	x	x	
Eucalyptus sp.	Eucalypt		x		
Euchiton sphaericus	Star cudweed	x	x		
Euphorbia parvicaruncula	Rough-seeded spurge		x		
Euphorbia sp.	Spurge		x		
Euphorbia tannensis	Desert spurge		x		
Exocarpos aphyllus	Leafless Cherry	x	x	x	
Frankenia serpyllifolia	Thyme Sea-heath	x	x	x	
Frankenia sp.	Seaheath		x		
Galium gaudichaudii	Rough bedstraw		x		
Geijera linearifolia	Sheep Bush	x	x	x	
Geranium retrorsum	Common cranes bill	x	x		
Glycine rubiginosa	Twining glycine	x	x		
Gnephosis sp.			x		
Goodenia calcarata	Streaked goodenia	x	x		
Goodenia fascicularis	Silky Goodenia			x	
Goodenia pinnatifida	Cut-leaved goodenia	x	x		
Goodenia pusilliflora	Small flowered goodenia	x	x		

Species	Common Name	BDBSA	PER	Jacobs	Status
Grevillea huegelii	Comb spider-flower	x	x		
Hakea leucoptera	Needle bush		x		
Halgania cyanea	Rough halgania		x		
Haloragis sp.	Raspwort		x		
Harmsiodoxa brevipes	Short cress		x		
Hyalosperma cotula			x		
Hyalosperma demissum	Dwarf sunray		x		
Hyalosperma glutinosum	Golden sunray		x		
Hyalosperma semisterile	Orange sunray	x	x		
Hydrocotyle callicarpa	Tiny pennywort		x		
Hypochaeris sp.			x		
Isoetopsis graminifolia	Grass cushion	x	x		
Isotoma petraea	Rock isotome	x	x		
Ixiochlamys cuneifolia	Silverton daisy		x		
Ixiochlamys nana	Small fuzzweed		x		
Lachnagrostis aemula	Blown grass		x		
Lawrencia sp.			x		
Leiocarpa websteri	Plover-daisy	x	x		
Lemooria burkittii	Wires-and-wool	x	x	x	
Lepidium leptopetalum	Slender peppercress		x		
Lepidium papillosum	Warty peppercress	x	x		
Leptorhynchos baileyi			x		
Levenhookia dubia	Hairy stylewort		x		
Limosella curdieana	Large mudwort		x		
Lomandra effusa	Scented mat-rush		x		
Lotus cruentus	Redflower lotus	x	x		
Lycium australe	Australian Boxthorn	x	x	x	
Lysiana exocarpi	Harlequin Mistletoe		x		
Lysiana exocarpi ssp. exocarpi	Harlequin Mistletoe	x	x	x	
Maireana aphylla	Cotton-bush	x	x		
Maireana appressa		x	x		
Maireana astrotricha	Low bluebush	x	x		
Maireana brevifolia	Short-leaf Bluebush	x		x	
Maireana erioclada	Rosy Bluebush	x	x	x	
Maireana georgei	Satiny Bluebush	x	x	x	
Maireana integra		x	x		
Maireana lobiflora	Lobed bluebush		x		
Maireana pentatropis	Erect Mallee Bluebush	x	x	x	
Maireana pyramidata	Black Bluebush	x	x	x	
Maireana radiata	Grey bluebush	x	x		

Species	Common Name	BDBSA	PER	Jacobs	Status
Maireana sedifolia	Bluebush	x	x	x	
Maireana sp.			x		
Maireana trichoptera		x	x		
Maireana triptera	Three-wing bluebush	x	x		
Maireana turbinata		x	x		
Marsdenia sp.			x		
Marsilea drummondii	Common Nardoo	x	x	x	
Medicago sp.	Medic	x	x		
Melaleuca lanceolata	Dryland Tea-tree	x	x	x	
Melaleuca pauperiflora	Borree		x	x	
Menkea australis			x		
Menkea sp.			x		
Microseris lanceolata	Yam daisy	x	x		
Millotia myosotidifolia	Broad-leaved millotia		x		
Millotia tenuifolia	Soft millotia		x		
Minuria cunninghamii	Bush minuria	x	x	x	
Minuria leptophylla	Minnie daisy		x		
Muehlenbeckia florulenta			x	x	
Myoporum platycarpum	False Sandalwood	x	x	x	
Nicotiana goodspeedii	Small-flowred tobacco	x	x		
Nicotiana velutina	Velvet tobacco	x	x		
Nitraria billardierei	Nitrebush	x	x		
Olearia calcarea		x	x		
Olearia floribunda	Heath daisy-bush	x	x		
Olearia muelleri	Mueller's Daisy-bush	x		x	
Olearia pimeleoides	Pimelea Daisy-bush	x	x	x	
Omphalolappula concava	Burr stickseed	x	x		
Osteocarpum salsuginosum	Bonefruit		x		
Oxalis perennans	Native Sorrel	x	x	x	
Oxalis sp.			x		
Parietaria debilis	Smooth nettle		x		
Philotheca linearis	Narrow-leaf wax-flower	x	x		
Phlegmatospermum cochlearinum	Oval-podded cress		x		
Phlegmatospermum eremaeum	Spreading cress		x		SA NPW: Rare
Pimelea micrantha	Riceflower	x	x		
Pimelea microcephala subsp. microcephala	Riceflower	x	x		
Pittosporum angustifolium	Native Apricot	x	x	x	
Plantago drummondii	Dark Plantain	x	x	x	
Poa sp.			x		

Species	Common Name	BDBSA	PER	Jacobs	Status
Poaceae sp.			x		
Podolepis capillaris	Wiry podolepis	x	x		
Podolepis sp.			x		
Podolepis tepperi	Delicate everlasting		x		
Pogonolepis angustifolia			x		
Pogonolepis muelleriana	Stiff cup-flower		x		
Poranthera microphylla	Small poranthera		x		
Prasophyllum odoratum	Leek-orchid		x		
Pterocaulon sphacelatum			x		
Pterostylis biseta		x	x		
Ptilotus nobilis	Yellow-tails	x	x		
Ptilotus obovatus		x	x	x	
Ptilotus seminudus	Rabbit-tails	x	x		
Ptilotus sp.			x		
Rhagodia crassifolia	Fleshy Saltbush	x	x	x	
Rhagodia parabolica	Mealy Saltbush	x	x	x	
Rhagodia sp.			x		
Rhagodia spinescens	Spiny Saltbush	x	x	x	
Rhagodia ulicina	Intricate Saltbush	x	x	x	
Rhodanthe corymbiflora	Grey sunray	x	x		
Rhodanthe laevis	Smooth sunray	x	x		
Rhodanthe moschata	Musk sunray	x	x		
Rhodanthe polygalifolia	Milkwort Everlasting	x		x	
Rhodanthe pygmaea	Pigmy Daisy	x	x	x	
Rhodanthe sp.			x		
Rhodanthe stricta	Slender Everlasting	x	x	x	
Rhodanthe stuartiana	Clay sunray	x	x		
Rytidosperma setaceum			x	x	
Rytidosperma sp.			x		
Salsola australis	Buckbush	x		x	
Salsola tragus	Buckbush		x		
Santalum acuminatum	Quandong	x	x	x	
Santalum spicatum	Sandalwood	x	x	x	SA NPW: Vulnerable
Sarcocornia blackiana	Thick-head glasswort		x		
Sarcocornia sp.			x		
Scaevola spinescens	Spiny Fanflower	x	x	x	
Schoenia ramosissima	Dainty everlasting	x	x		
Sclerolaena bicornis	Goathead burr		x		
Sclerolaena brachyptera	Short-wing Bindyi	x	x	x	
Sclerolaena decurrens	Green copperburr		x		

Species	Common Name	BDBSA	PER	Jacobs	Status
Sclerolaena diacantha	Grey Bindyi	x	x	x	
Sclerolaena divaricata	Tangled copper-burr	x	x		
Sclerolaena eriacantha	Silky copperburr	x	x		
Sclerolaena lanicuspis	Woolly copperburr	x	x		
Sclerolaena longicuspis	Long-spined poverty-bush		x		
Sclerolaena obliquicuspis	Oblique-spined Bindyi	x		x	
Sclerolaena patenticuspis	Spearfruit copperburr	x	x		
Sclerolaena sp.			x		
Sclerolaena uniflora	Small-spine Bindyi	x		x	
Sclerolaena ventricosa	Salt copperburr	x	x		
Senecio ? hispidulus			x		
Senecio gawlerensis	Groundsel	x	x		
Senecio glossanthus	Slender groundsel	x	x		
Senecio lautus	Variable groundsel		x	x	
Senecio quadridentatus	Cotton Groundsel	x	x	x	
Senna artemisioides ssp. Alicia				x	
Senna artemisioides ssp. coriacea				x	
Senna artemisioides ssp. filifolia	Fine-leaf Desert Senna	x	x	x	
Senna artemisioides ssp. petiolaris		x	x	x	
Senna artemisioides ssp. X coriacea	Broad-leaf Desert Senna	x	x	x	
Senna artemisioides subsp. artemisioides		x	x		
Senna artemisioides subsp. x sturtii	Dense Senna	x	x		
Senna sp.			x		
Setaria constricta	Knotty-butt Paspalidium	x	x	x	
Sida corrugata	Corrugated sida		x		
Sida intricata	Twiggy Sida	x	x		
Sida petrophila	Tall Sida	x	x		
Sida phaeotricha	Hill sida	x	x		
Sida sp.			x		
Sigesbeckia microcephala	Pale Indian weed		x		
Solanum coactiliferum	Tomato-bush	x	x	x	
Solanum ellipticum	Velvet Potato-bush	x	x	x	
Solanum horridum			x		
Solanum hystrix	Afghan thistle		x		
Solanum orbiculatum			x		
Solanum petrophilum	Rock Nightshade	x	x	x	
Solanum sp.			x		
Stellaria angustifolia				x	

Species	Common Name	BDBSA	PER	Jacobs	Status
Stenopetalum lineare	Narrow thread-petal	x	x		
Swainsona oliveri			x		
Swainsona phacoides	Dwarf swainsona		x		
Swainsona sp.			x		
Swainsona stipularis	Orange darling pea	x	x		
Tagetes minuta				x	
Tecticornia arborea			x		
Tecticornia indica		x	x		
Tecticornia pergranulata			x		
Tecticornia sp.			x		
Tecticornia tenuis				x	
Templetonia egena	Broombush Templetonia	x		x	
Tetragonia eremaea		x	x		
Tetragonia sp.			x		
Teucrium racemosum				x	
Themeda triandra	Kangaroo Grass		x		
Threlkeldia diffusa	Coast Bonefruit	x		x	
Thyridolepis mitchelliana	Mulga grass		x		
Thysanotus baueri	Mallee Fringe-lily	x		x	
Trachymene ornata	Sponge fruit	x	x		
Trianthema triquetra	Red spinach		x		
Trichanthodium skirrophorum	Woolly Yellow-heads	x	x	x	
Triodia irritans		x	x		
Triodia scariosa	Spinifex	x	x	x	
Tripogon loliiformis		x	x		
Urtica sp.			x		
Vittadinia cuneata	Fuzzweed		x		
Vittadinia gracilis	Woolly New Holland Daisy	x		x	
Vittadinia sp.			x		
Vulpia sp.			x		
Wahlenbergia communis	Tufted bluebell	x	x		
Wahlenbergia gracilenta	Annual bluebell	x	x		
Wahlenbergia sp.			x		
Wahlenbergia tumidifructa			x		
Westringia rigida	Stiff Westringia	x	x	x	
Wurmbea dioica subsp. dioica			x		
Wurmbea sp.			x		
Xerochrysum bracteatum	Golden everlasting		x		
Zaleya galericulata				x	
Zygochloa paradoxa	Sandhill cane-grass		x		

Species	Common Name	BDBSA	PER	Jacobs	Status
Zygophyllum ammophilum	Sand twinleaf	x	x		
Zygophyllum apiculatum	Pointed Twinleaf	x		x	
Zygophyllum aurantiacum ssp.		x		x	
Zygophyllum billardierei	Coast twinleaf		x		
Zygophyllum crenatum	Lobed twinleaf	x	x		
Zygophyllum eremaeum	Climbing twinleaf	x	x	x	
Zygophyllum humillimum			x		
Zygophyllum ovatum	Dwarf Twinleaf	x	x	x	
Zygophyllum sp.			x		

Table N2: Additional bird species with BDBSA records within the CEA, NOT recorded in the 2014 EBCR field survey

Species Name	Common Name	EPBC Act[1]	NPW[2]
Actitis hypoleucos	Common Sandpiper	MM, LM	R
Ardeotis australis	Australian Bustard		V
Arenaria interpres	Ruddy Turnstone	MM, LM	R
Biziura lobata	Musk Duck	LM	R
Cacatua leadbeateri	Major Mitchell's Cockatoo		R
Calidris tenuirostris	Great Knot	MM	R
Charadrius leschenaultii	Greater Sand Plover	MM	R
Cinclosoma castanotum	Chestnut-backed Quailthrush (Chestnut Quailthrush)		ssp
Cladorhynchus leucocephalus	Banded Stilt		V
Egretta garzetta	Little Egret	MM, LM	R
Emblema pictum	Painted Finch		R
Falco hypoleucos	Grey Falcon		R
Falco peregrinus	Peregrine Falcon		R
Haematopus longirostris	(Australian) Pied Oystercatcher		R
Haliaeetus leucogaster	White-bellied Sea-Eagle		E
Limosa lapponica	Bar-tailed Godwit	MW, LM	R
Neophema elegans	Elegant Parrot		R
Numenius madagascariensis	Far Eastern Curlew		V
Sterna hirundo	Common Tern	MM	R
Stictonetta naevosa	Freckled Duck		V

[1] National *Environment Protection and Biodversity Conservation Act* 1999 (EPBC Act) status: Endangered (EN), Vulnerable (VU), Migratory Marine (MM);

[2] South Australian *National Parks and Wildlife Act 1974 (*NPW Act) status: Endangered (E), Vulnerable (V), Rare (R),