Information Sheet on Ramsar Wetlands (RIS)

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9th Conference of the Contracting Parties (2005).

1. Name and address of the compilers of this form:

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DD MM YY

Designation date | Site Reference Number

2. Date this sheet was completed/updated:

May 2013

3. Country:

Australia

4. Name of the Ramsar site:

The precise name of the designated site in one of the three official languages (English, French or Spanish) of the Convention. Alternative names, including in local language(s), should be given in parentheses after the precise name.

The Coorong, and Lakes Alexandrina and Albert Wetland

5. Designation of new Ramsar site or update of existing site:

Site designated 1 November 1985

This RIS is for (tick one box only)**:**

a) Designation of a new Ramsar site ❑; or

b) Updated information on an existing Ramsar site ☒

6. For RIS updates only, changes to the site since its designation or earlier update:

a) Site boundary and area

The Ramsar site boundary and site area are unchanged : ❑

or

If the site boundary has changed:

i) the boundary has been delineated more accurately ☒; or

ii) the boundary has been extended ❑; or

iii) the boundary has been restricted** ❑

and/or

If the site area has changed:

i) the area has been measured more accurately ☒; or

ii) the area has been extended ❑; or

iii) the area has been reduced** ❑

** **Important note**: If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:
In accordance with Article 3.2 of the Convention, the Secretariat was formally notified of potential changes in the ecological character of the site in December 2006. An Ecological Character Description (ECD) was provided, and while detailed quantitative data describing the 1985 listing condition are not available for many ecological components, processes, or services/benefits, the 2006 ECD concluded that the site has been declining for at least 20-30 years prior to listing (Phillips and Muller 2006). The rate of decline has been exacerbated by Australia's recent drought conditions (in the early 2000s to 2010), including the loss of key species and declines in much of the biota (e.g. Ruppia spp., macroinvertebrates and fish species) and the habitats within the site. The condition of the site was identified as an issue of considerable concern in the Australian Government's National Report submitted to the 10th Meeting of the Conference of the Contracting Parties, in 2008. A subsequent update was provided at 11th Meeting of the Conference of the Contracting Parties, in 2012 outlining that the condition of the site has stabilised as a result of the activities of the Australian and South Australian Governments and has now improved due to significant rainfall events experienced across the Murray–Darling Basin since the second half of 2010. Implications on ecological character are still being assessed.

The 2006 ECD notes that while the site was changing prior to listing, it is believed to have further declined since its listing in 1985. The reasons for these changes are complex, but include human-induced influences such as alterations to water flows into and within the site exacerbating the influence of climate change. Acid sulfate soils have emerged as an additional issue to site management. Importantly, despite these changes the site presently continues to meet eight of the Ramsar Convention's site nomination criteria.

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7. Map of site:
Refer to Annex III of the *Explanatory Note and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as:

i**) a hard copy** (required for inclusion of site in the Ramsar List): ☒;

ii**) an electronic format** (e.g. a JPEG or ArcView image) ☒;

iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables** ☒.

b) Describe briefly the type of boundary delineation applied:
e.g. the boundary is the same as an existing protected area (nature reserve, national park, etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The Ramsar site encompasses the Coorong National Park, Lake Alexandrina, Lake Albert, and tributaries, up to +0.85m AHD. Where unalienated crown land, DEWNR reserve or crown land under licence exists adjacent to the waters edge the boundary has been extended to include this cadastral parcel. The site excludes all privately owned fringing wetlands around the edge of the lakes except for land subject to inundation in Clayton Bay, Marshall Bight and Tookayerta Creek.

The boundary for the freshwater wetlands starts on the south-western shore of Goolwa Channel at the Goolwa barrage and follows the water's edge past Goolwa and up into Currency Creek water body. It extends west upstream including Currency Creek Game Reserve (proclaimed 19/06/1975 and 27/05/1976) as the creek follows up between cadastral boundaries across Strathalbyn to Goolwa Road until it terminates at the junction of private land just south west of Currency Creek gazetted settlement (at the point nearest to 139º 45' 4"E, -35º 27' 4"S).

It then follows the northern bank of Currency Creek downstream and around into Finniss River. In the Finniss River it follows the edge of the water body in a generally northern direction and then generally westerly into Tookayerta Creek/Black Swamp. The boundary goes as far as the western side of the Victor Harbor rail reserve (at the point nearest to 139º 47' 28"E, -35º 24' 47"S).

The boundary then follows the northern edge of the swamp back into Finniss River where it continues upstream over winery road to then encompass the inundation area of the river (138 º48' 54"E, -35º 23' 28"S). It then continues downstream of Finniss River into Goolwa Channel past Clayton Bay, around Dunn Lagoon including Goose and Goat Island.

The boundary then follows around Sturt Peninsula to Point Sturt and into Lake Alexandrina. In Lake Alexandrina it heads north around the foreshore of Lake Alexandrina, past Milang and around Tolderol point including Tolderol Game Reserve. It excludes the point extending east from Kindaruar homestead (gazetted 15/2/2007).

It continues along the water's edge around Dog Lake, Mosquito Point and Boggy Lake. It comes across the top of Lake Alexandrina past Mulgandawa and around Pomanda Island but excludes the island and the spit leading to the island. The boundary then heads north from Pomanda Island around McHughes Lake, including Pelican Lagoon, at the most northern extent of Lake Alexandrina. The boundary crosses where the River Murray and Lake Alexandrina meet (139º 22'E, -35º 21' 54"S) to the eastern shore of Lake Alexandrina.

The Boundary then follows south down to Low Point, around Poltalloch Plains to Point Malcolm, into The Narrows on the northern shore and through to Lake Albert. The boundary circulates clockwise around the edge of Lake Albert past Meningie including Bascombe Bay and Kennedy Bay and around the western shore.

It travels along the southern shore of The Narrows to Lake Alexandrina and around in southerly direction past Point McLeay, around Loveday Bay and Salt Lagoon encompassing Salt Lagoon Islands Game Reserve. It passes around Wamwarrum to connect with the Coorong National Park at Pelican Point at the eastern end of the Tauwitchere Barrage.

The southern component of the boundary from the barrages between Lake Alexandrina and the Murray Mouth back up to the Goolwa barrage includes the estuarine wetlands of the South and North Coorong Lagoons, adjacent coastal dunes to low water mark as encompassed by the Coorong National Park Boundary. The park boundary is based on cadastral parcels gazetted from 27th April 1972 to 23rd August 2001[1]. All islands and road reserves within the Coorong National Park have been included in the Ramsar boundary.

8. Geographical coordinates (latitude/longitude, in degrees and minutes):
Provide the coordinates of the approximate centre of the site and/or the limits of the site. If the site is composed of more than one separate area, provide coordinates for each of these areas.

Geographic Coordinates are in degrees minutes, seconds referenced to the Geocentric Datum of Australia (GDA94).

Ramsar site, outer boundary geographic extent coordinates Latitude: (approx.) 35º 18'S to 36º 33'S; Longitude: (approx.) 138º 44'E to 139º 51'E.

9. General location:

[1] Gazettal dates for the Park are: 27/4/1972, 11/12/1975, 2/6/1977, 24/11/1977, 14/9/1978, 3/5/1979, 4/12/1980, 21/5/1981, 30/9/1982, 28/7/1983, 29/11/1984, 30/5/1985, 19/12/1991, 14/1/1993, 23/8/2001.

Include in which part of the country and which large administrative region(s) the site lies and the location of the nearest large town.

Located at the mouth of the River Murray, about 75km south east of the city of Adelaide. The site encompasses Lake Alexandrina, six main islands (Mundoo, Mud, Long, Hindmarsh, Tauwitchere, Salt Lagoon Island), lower reaches of Currency Creek and Finniss River, Lake Albert, Narrung Narrows, the Coorong lagoons and other ephemeral lakes.

10. Elevation: (in metres: average and/or maximum & minimum)

Sea level

11. Area: (in hectares)

142, 530 hectares.

12. General overview of the site:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

The Coorong is a long, shallow brackish to hypersaline lagoon 140 km in length that is separated from the Southern Ocean by a narrow sand dune peninsula (Webster 2010). The Lakes Alexandrina and Albert form the mouth of the River Murray and are comprised of fresh to brackish/saline waters. Wetlands specifically included are:

- Lake Alexandrina including Tolderol, Mud Islands and Currency Creek Game Reserves, otherwise mainly Crown Lands.
- Lake Albert - Mainly Crown Lands.
- Tributaries including Finniss River and Currency Creek.
- Coorong – mainly covering Coorong National Park and Game Reserve, otherwise mainly Crown Lands.

The site is one of Australia's icon wetlands supporting critically endangered, endangered, threatened and vulnerable species and ecological communities. Phillips and Muller (2006) outline that it supports extensive and diverse waterbird, fish and plant assemblages; reliant on its complex mosaic of wetland types.

The area is a popular recreational site, while also supporting a range of commercial activities related to tourism, irrigated agriculture, and commercial fishing most notably.

The Ngarrindjeri Indigenous people have a long association with the Coorong and Lower Lakes and the site has great cultural significance for them. They retain these close links with the wetland and its biodiversity through these cultural links.

13. Ramsar Criteria:

Tick the box under each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11). All Criteria which apply should be ticked.

1	2	3	4	5	6	7	8	9
☒	☒	☒	☒	☒	☒	☒	☒	☐

14. Justification for the application of each Criterion listed in 13 above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Criterion 1: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

The Coorong, and Lakes Alexandrina and Albert Wetland consists of a unique mosaic of 23 Ramsar wetland types, including intertidal mud, sand or salt flats, coastal brackish/saline lagoons, permanent freshwater lakes, permanent freshwater marshes/pools, shrub-dominated wetlands,

and water storage areas. The site is unique in its wide representation of wetland types within the bioregion and is the only estuarine system within the Murray-Darling Basin.
Appendix C from Phillips and Muller (2006) outlines the extent of the 23 habitat types located within the site.

Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.
The listing of the Swamps of the Fleurieu Peninsula as a critically endangered ecological community under the *EPBC Act* is notable as this area and the Ramsar site partially overlap. This same area (in part) provides habitat for the endangered Mount Lofty Ranges Southern Emu-Wren.

Common name	Scientific name	Classification				
		IUCN	CITES	CMS / JAMBA / CAMBA / ROKAMBA	National Status	South Australian Status
Birds[1]						
Orange-bellied Parrot	*Neophema chrysogaster*	CE	Appendix I	JAMBA	CE	E
Australasian Bittern	*Botaurus poiciloptilus*	E	-		E	V
Mount Lofty Ranges Southern Emu-Wren	*Stipiturus malachurus intermedius*	-	-	JAMBA	E	E
Fairy Tern	*Sternula (Sterna) nereis*	V	-		V	E
Australian Painted Snipe	*Rostratula australis (benghalensis*	E	-	CAMBA	V	R
Hooded Plover	*Thinornis rubricollis*	V				
Fish						
Murray Hardyhead	*Craterocephalus fluviatilis*	E	-	-	E	
Yarra Pygmy Perch	*Nannoperca obscura*	V	-	-	V	P[2]
Murray Cod	*Maccullochella peelii peelii*	CE	-	-	V	
Silver Perch	*Bidyanus bidyanus*	V	-	-		P[2]
Big-bellied Seahorse	*Hippocampus abdominalis*		Appendix II	-	Listed Marine	
Amphibians						
Southern Bell Frog	*Litoria raniformis*	E	-	-	V	V
Plants						
Sandhill Greenhood Orchid	*Pterostylis arenicola*		-	-	V	V
Metallic Sun-orchid	*Thelymitra epipactoides*		-	-	E	E

Silver Daisy-bush	*Olearia pannosa ssp pannosa*		-	-	V	V

[1] From O'Connor et al. (2012). An additional 8 non-wetland-dependent species that meet the Criteria can be found in Appendix 1a of O'Connor et al. (2012). The 49 species listed under the Migratory Bird Agreements can also be found in O'Connor et al. (2012).
[2] Protected status (*Fisheries Management Act 2007*)
Note: A provisional listing of fish species has been developed for South Australia, but has not yet been endorsed.

Criterion 3: A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

The Ramsar site supports a diverse range of plant species, including two South Australian endemic wetland-dependent flora species (Eichler et al. 2011); the Sandhill Greenhood Orchid (*Pterostylis arenicola*) and Silver Daisy-bush (*Olearia pannosa ssp pannosa*). In addition to those species and ecological community identified in Criterion 1, the site also supports several vegetation species and the communities of biodiversity significance (Eichler et al. 2011). These include diverse reed beds, River Red Gum (*Eucalyptus camaldulensis*), Freshwater herblands (e.g. *Triglochin* sp.), Cutting Grass (*Gahnia filum*) sedgeland, Swamp Paperbark (*Melaleuca halmaturorum*) woodland, Lignum (*Muehlenbeckia florulenta*) shrubland and Samphire chenopod shrubland (e.g. *Tecticornia pergranulata ssp. Pergranulata, Suaeda australis, Sarcocornia quinqueflora* and *Juncus kraussi*).

The Ramsar site supports approximately 43 fish species (Higham et al. 2002) including the Basin-endemic Yarra Pygmy Perch (*Nannoperca obscura*), Small-mouthed Hardyhead (*Atherinosoma microstoma*), Lagoon Goby (*Tasmanogobius lasti*), and Tamar Goby (*Afurcagobius tamarensis*). In addition to the conservation significant species listed under Criterion 1, the site supports three fish species protected under the *Fisheries Management Act 2007* in South Australia; Freshwater Catfish (*Tandanus tandanus*), Southern Purple-spotted Gudgeon (*Morgurnda adspersa*) and Southern Pygmy Perch (*Nannoperca australis*) (Bice 2009). Other species of conservation significance in South Australia include; Flat-headed Gudgeon (*Philypnodon grandiceps*), Dwarf Flat-headed Gudgeon (*Philypnodon macrostomus*), Unspecked Hardyhead (*Craterocephalus stercusmuscarum fulvus*) and Congolli (*Pseudophritis urvillii*), Pouched Lamprey (*Geotria australis*), Short-headed Lamprey (*Mordacia mordax*), Mountain Galaxias (*Galaxias olidus*), Estuary Perch (*Macquaria colonorum*), and Short-finned Eel (*Anguilla australis*) (Bice 2009; Lintermans 2009). The site is also the only access point to the Murray-Darling Basin for diadromous fish species.

The Ramsar site supports high bird species richness, with 307 bird species having been recorded within 1km of the Ramsar site, 119 of which utilise wetland habitat (O'Connor et al. 2012). In addition, the site contains the majority of waterbird species that occur within the Murray-Darling Basin. The site supports the highest waterbird species richness and abundance of any of The Living Murray Icon sites, with 92% of the ~250,000 waterbirds counted across all six icon sites, and 44 of the 46 waterbird species surveyed (O'Connor et al. 2012). In addition to those listed in Criterion 1, 10 species of birds that are of state or regional conservation significance (O'Connor et al. 2012); Little Tern (*Sternula (Sterna) albifrons*), White-bellied Sea Eagle (*Haliaeetus leucogaster*), Banded Stilt (*Cladorhynchus leucocephalu*), Eastern Curlew (*Numenius madagascariensis*), Freckled Duck (*Stictonetta naevosa*), Lewin's Rail (*Lewinia (Rallus) pectoralis*), Australasian Shoveler (*Anas rhynchotis*), Blue-billed Duck (*Oxyura australis*), and Sooty Oystercatcher (*Haematopus fuliginosus*).

Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

The Ramsar site supports 57 wetland-dependent species that are listed within international and national migratory agreements (O'Connor et al. 2012). Appendix 1 of O'Connor et al. (2012) summarises the species that have been assessed as qualifying against the Ramsar Criteria but are non wetland-dependent.

Fifteen species are known to regularly breed at the site, including annual breeding species such as Black Swan (*Cygnus atratus*), Fairy Tern (*Sternula (Sterna) nereis*) and Hooded Plover (*Thinornis rubricollis*), regular breeding species such as Australian White Ibis (*Threskiornis molucca*), Pacific Black Duck (*Anas superciliosa*), and Pied Cormorant (*Phalacrocorax varius*) (O'Connor et al. 2012). Appendix 1c (O'Connor et al. 2012) summarises the non wetland-dependent species that regularly breed at the site, and Appendix 2 (O'Connor et al. 2012) summarises species that regularly breed at the site but the data is deficient. Bird species that breed in large numbers at Lake Eyre after high rainfall events but breed in the site in lower numbers during drier years include Australian Pelican (*Pelecanus conspicillatus*), Grey Teal (*Anas gracilis*), Silver Gull (*Chroicocephalus novaehollandiae*), and Caspian Tern (*Hydroprogne (Sterna) caspia*) (O'Connor et al. 2012). Other bird species that rely on the site for adult survival when inland lakes are dry include the Red-necked Avocet (*Recurvirostra novaehollandiae*), Chestnut Teal (*Anas castanea*), Australian Shelduck (*Tadorna tadornoides*), and Banded Stilt (*Cladorhynchus leucocephalus*) (O'Connor et al. 2012).

At least 56 bird species regularly use the Ramsar site as a critical refuge while moulting, including the Australian Shelduck, Chestnut Teal and Black Swan, Banded Stilt, Black-winged Stilt (*Himantopus himantopus*), Red-necked Avocets, and Australian Pelicans (O'Connor et al. 2012). All international migrants gradually replace their flight feathers upon landing at the site in summer, and therefore those species also utilise the site for moulting.

Additionally, the site supports a number of diadromous fish species (including Congolli, Common Galaxias, Pouched Lamprey and Short-headed Lamprey), estuarine and freshwater fish species at critical stages of their life cycle or as refuge (Higham et al. 2002; Appendix D and E from Phillips and Muller 2006; Bice 2009).

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

Annual census data shows that between 71,000 and 329,000 birds are supported within the Ramsar site (O'Connor et al. 2012). Species that contribute to this number include Australian Pelican, Australian Shelduck, Banded Stilt, Grey Teal and Red-necked Stint (*Calidris ruficollis*). The table below summarises the total waterbird number from 1985 to 2011 from O'Connor et al. (2012). Note that the site has consistently supported in excess of 20,000 waterbirds at the site since 1985, despite the census providing partial assessment until 2009.

Survey (month)	Common name	Scientific name	South Lagoon Only	Coorong Only									Coorong and Lower Lakes				% Years qualify since 2000
			1985	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	
David Paton (Jan)	Australian Pelican	*Pelecanus conspicillatus*	6045	4672	5656	4072	2924	2918	2293	3203	3124	1575	5425	7384	7260	8987	100% (13)
	Australian Shelduck	*Tadornis tadornoides*	6059	4630	8581	2738	8201	8315	8536	20461	2613	6148	28483	41203	31849	29688	100% (13)
	Banded Stilt	*Cladorhynchus leucocephalus*	6208	2354	15475	14774	6762	6356	32305	74859	64552	23470	213109	49448	18054	11691	100% (13)
	Black Swan	*Cygnus atratus*	676	2600	2500	1227	3488	1012	706	1764	1529	1807	1782	3400	4381	2767	92% (12)
	Chestnut Teal	*Anas castanea*	660	7312	15293	21228	13143	17123	7149	13318	3037	5258	7073	5049	5149	8681	100% (13)
	Curlew Sandpiper*	*Calidris ferruginea*	9449	8157	2324	3633	2364	1830	2188	4513	5073	1642	938	1988	217	50	77% (10)
	Greater Crested Tern	*Thalasseus bergii*	6687	4941	4800	2783	1300	2767	5638	1908	8564	4016	7719	11958	4090	7140	100% (13)
	Grey Teal	*Anas gracilis*	59113	10811	17901	39510	30607	11435	12260	11077	5068	5443	19644	21388	1026	46910	100% (13)
	Hoary-headed Grebe	*Poliocephalus poliocephalus*	16766	8461	3069	2983	2324	2432	2636	4949	4419	4435	14961	9120	0	7403	92% (12)
	Red-capped Plover	*Charadrius ruficapillus*	2158	1223	1638	625	1576	769	474	1094	1245	1393	2729	1598	73	1320	69% (9)
	Red-necked Stint	*Calidris ruficollis*	29020	25524	27047	28413	43300	33752	23606	37207	17478	13930	44050	48671	6605	21284	100% (13)
	Sharp-tailed Sandpiper	*Calidris acuminata*	6013	13022	4399	13335	17473	10135	11581	33897	10046	12069	25693	31086	178	5681	92% (12)
	Silver Gull	*Larus novaehollandiae*	4090	7756	10418	7909	8474	5218	8118	16398	6479	5448	14017	13618	17668	11239	100% (13)
	Whiskered Tern	*Chlidonias hybridus fluviatilis*	2656	4660	4603	3163	3593	3913	4569	17259	7549	5416	14718	9070	235	12172	92% (12)
Total waterbird abundance per year (>20,000 waterbirds)			155600	106123	123704	146393	145529	107975	122059	241907	140776	92050	400341	254981	96785	175013	

Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

The Ramsar site consistently supports one percent or more of the population of the following species (total population size estimated by Wetlands International 2006).

Common name	Scientific name	1% threshold	1985 Count	2006 Count	2012 Count	Reference
Australian Pied Oystercatcher	*Haematopus longirostris*	110	142	220	130	O'Connor et al. (2012)
Australian Shelduck	*Tadornis tadornoides*	2,400	6,059	20,461	29,688	O'Connor et al. (2012)
Banded Stilt	*Cladorhynchus leucocephalus*	2,100	6,208	74,859	11,691	O'Connor et al. (2012)
Caspian Tern	*Hydroprogne (Sterna) caspia*	1,000	329	856	1,531	O'Connor et al. (2012)
Chestnut Teal	*Anas castanea*	1,000	660	13,318	8,681	O'Connor et al. (2012)
Curlew Sandpiper	*Calidris ferruginea*	1,800	9,449	4,513	50	O'Connor et al. (2012)
Fairy Tern	*Sterna nereis nereis*	25	1,330	283	362	O'Connor et al. (2012)
Red-necked Stint	*Calidris ruficollis*	3,200	29,020	37,2074	21,284	O'Connor et al. (2012)
Sharp-tailed Sandpiper	*Calidris acuminata*	1,600	6,013	33,897	5,681	O'Connor et al. (2012)
Silver Gull	*Larus novaehollandiae*	5,500	4,090	16,398	11,239	O'Connor et al. (2012)

Common name	Scientific name	1% threshold	1982 Count	2006 Count	2012 Count	Reference
Red-necked Avocet	*Recurvirostra novaehollandiae*	1,100	5,401	2,411	1,720	Wainwright and Christie (2008); unpublished data
Red-capped Plover	*Charadrius ruficapillus*	950	5,152	1,231	2,710	Wainwright and Christie (2008); unpublished data
Sanderling	*Calidris alba*	220	929	173*	20	Wainwright and Christie (2008); unpublished data

* Did exceed 1% threshold in the year prior (2005) with 235 recorded. (Wainwright and Christie 2008) and unpublished data.

Criterion 7: A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.

To date, around 80 fish species have been recorded in the Ramsar site (Higham et al. 2002; Appendix C Attachment 3 Phillips and Muller 2006). The site is considered to support 43 of these species (Higham et al. 2002). This represents over 50% of the number of fish species

found within the Murray-Darling Basin (Lintermans 2009) highlighting its importance to the bioregion. The site also supports four Basin-endemic species including Yarra Pygmy Perch, Small-mouthed Hardyhead, Lagoon Goby, and Tamar Goby. As outlined in Criterion 4, the site is also the only access point to the Murray-Darling Basin for diadromous fish species.

Criterion 8: A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

The Ramsar site provides important habitats, feeding areas, dispersal/migratory pathways, and spawning sites for numerous fish species of direct (including commercially targeted (Mulloway *Argyosomus hololepidotus* and Yellow-eye Mullet *Aldrichetta forsteri*) and indirect (including non-consumptive species such as Australian Smelt *Retropinna semoni* and Small-mouthed Hardyhead) fisheries significance. Recreational, commercial and Indigenous fishing are key uses of the Ramsar site. The site supports around 43 species of fish (Higham et al. 2002), including a range of freshwater, estuarine, marine, and diadromous fish species which utilise the site in ways specified under this Criterion. Critically, the site forms the only estuarine habitat for the Murray-Darling Basin and is the only access point for diadromous fish species within the Basin.

15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region: Murray-Darling Basin

b) biogeographic regionalisation scheme (include reference citation): Commonwealth of Australia (Bureau of Meteorology), 2011, Australian Hydrological Geospatial Fabric

16. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

There are a broad range of physical features and processes which together control the wetland ecosystems within the site. The location of the Ramsar site at the terminus of the Murray-Darling Basin and abutting the Southern Ocean exposes it to the impacts of many climatic perturbations as well as extremely strong winds and tidal action at a local scale (Phillips and Muller 2006). The following provides a brief summary of key physical features of the site.

Climate

The climate is typically Mediterranean with mild, wet winters and hot, dry summers. Average annual rainfall has been estimated as approximately 450 mm (Brandle 2002). Of this rainfall, the majority falls during the six months from May to October, with the monthly maximum rainfall occurring in June (average of 61.7 mm) (DfW 2012). The expected average maximum daily temperature is highest in February at 26.4°C, lowest in July at 14.9°C, and an annual average at 20.8°C (DfW 2012). The minimum daily temperature is at its maximum in January and February at 13.9°C, and has an annual daily average of 10.2°C (DfW 2012). The winds in the region generally reflect the migration of anticyclones and cold fronts across the southeast of the continent (Barnett 1993). In the summer and autumn months, south-westerlies, southerlies and south-easterlies are more frequent as a result of sea breezes, whereas in winter the winds are more north-westerlies and northerlies (Barnett 1993).

Tidal Hydraulics

The local tidal pattern is a mixture of diurnal and semi-diurnal, with a tidal range between -0.1 and 1.7 m AHD (DfW 2012). The tidal hydrodynamics and patterns in fluvial hydrology influence the morphological condition of the Murray Mouth channel. The Murray Mouth is the connecting channel between the Coorong and the Southern Ocean. Its openness is critical to the Coorong because it affects the way the Coorong exchanges water with the sea and in setting water levels within the Coorong, and at times Lakes Alexandrina and Albert (Higham 2012). Inside the Coorong, tidal ranges vary between ~0.2m during neap tides to ~1m during spring tides (Webster 2005). The tides penetrate into the Murray estuary region causing water level variations that facilitate frequent changes in exposure and submergence of mudflats in the Coorong which is an important foraging habitat for shorebirds. During periods of low barrage flows, such as between 2002 and 2010, a dredge was used to maintain a connection between the ocean and the Coorong that permitted fish passage connectivity between the Coorong and the ocean and the tidal exposure of mudflat habitat.

Fluvial Hydrology

The hydrology of the Ramsar site is a spatially and temporally variable interaction of inflows from the River Murray, other surface water and groundwater sources, and the Southern Ocean (MDBA 2012). Lakes Alexandrina and Albert are large freshwater lakes which are physically separated from the Murray Mouth and Coorong by a series of man-made barrages and islands. Water levels in the Lower Lakes fluctuate seasonally - they are generally higher in late spring and lower in late summer/autumn because of river operations and seasonal changes in River Murray and local tributary inflows, as well as climatic factors such as evaporation and local rainfall (Phillips and Muller 2006).

In addition to River Murray inflows, rainfall directly on the wetland's surface and tributaries from the Eastern Mount Lofty Ranges (Angas, Bremer and Finniss Rivers, Tookayerta and Currency Creeks) contribute to the Lake inflows, with an estimated average surface-water contribution of 120 GL per year (MDBA 2012). Flow into and out of Lake Albert, a terminal wetland, is via a narrow connection with Lake Alexandrina (the Narrung Narrows). Exchange between the Lakes is predominantly driven by wind seiche, evaporation and water level difference between Lake Alexandrina and Albert (MDBA 2012). Lake Albert acts as a sink for salt and sediment from River Murray inflows, overland run-off, groundwater and lakeshore erosion (Phillips and Muller 2006). The slow-moving water allows for deposition of silts and sediments particularly at the southern end of the lake, where extensive siltation reduces water depth and topographical diversity (Phillips and Muller 2006).

The operation of the barrages has significantly changed the hydrological regime of the Lower Lakes and the Coorong. Lake levels are now more elevated and static than under natural conditions. Historically, the target lake level was 0.75 m AHD but varied annually between approximately 0.6 m and 0.83 m AHD. The lake level is surcharged to approximately 0.83 m AHD in early spring each year to allow for evaporation losses during summer. When the lake level exceeds 0.83 m AHD, freshwater spillage may occur near the barrages. Prior to the recent drought, the lake level had to be maintained above 0.6 m AHD to enable flood irrigation in the Lower Murray Reclaimed Irrigation Areas below Lock 1 (Mannum-Wellington) (MDBC 2007).

Maintaining elevated lake levels has affected the geomorphology of the lakes, including;

- prograded shorelines in sheltered areas;
- accelerated shoreline erosion in exposed localities;

- accelerated rates of sedimentation in the lakes; and
- changed the character of the sediments deposited.

This has implications for littoral plants and wildlife communities, infrastructure damage, turbidity and nutrient levels in the lakes (MDBC 2007).

The Coorong is a long, shallow, estuarine to hypersaline lagoon. Because the majority of its freshwater input occurs through the barrages close to the same end as the connection to the sea, the Coorong acts as an inverse estuary (Webster 2005). Changes in the Coorong hydrodynamics are driven by Murray Mouth channel depth, barrage flows, surface water inflows at the southern end of the Coorong from the Upper South East, meteorological changes (evaporation from and precipitation to the water surface, wind blowing over the water surface), and water level variation in Encounter Bay (including tidal, weather band and seasonal) (Webster 2005). Water level changes in the Coorong can be short period wind-induced variation, short period increases when the barrages are opened and seasonal variations due to seasonal sea level changes (Webster 2005). Additionally, water levels rise during periods of significant barrage releases in response to the Murray mouth acting as a hydrological constriction.

Water levels in the Coorong undergo a seasonal cycle of up to approximately 0.7 m in range, higher levels tending to occur in late winter to early spring and lower in late summer to early autumn due to seasonal sea level patterns (Webster 2005). Although the North Lagoon is a permanent water body, the area of inundation varies both diurnally with the tides and seasonally due to sea levels and inflows, resulting in the exposure of mudflats and intertidal marshes along the shoreline (Webster 2010). This area provides important habitat for a large number of waterbirds, including migratory shorebirds in spring and summer (Paton et al. 2009). Typically, water levels within the South Lagoon vary seasonally by approximately 0.9 m, being higher in winter and lower in summer, resulting in the seasonal exposure of mudflats which provide extensive areas of foraging and nesting habitat for large numbers of birds (Phillips and Muller 2006). During the summer months, the water level in the Coorong drops as sea level drops and barrage flows diminish (Webster 2005). Once the water level drops to 0 m AHD, the channel connecting the lagoons becomes shallow enough that it cannot support a flow sufficient to replenish the evaporation loss from the South Lagoon (Webster 2010). Consequently, the water level in the South Lagoon continues to drop below the level in the North Lagoon. Under these conditions, water level in the South Lagoon is determined by both the evaporation rate and by the depth of the Parnka Point channel (Webster 2010).

Since river regulation, barrage releases have been insufficient to counteract the incoming tidal flow and have resulted in congestion of the channels inside the estuary, altering the original hydrological conditions. Congestion of the mouth has allowed coarse marine sands to smother productive mudflats and reduce the area of suitable habitat for aquatic plants in the estuary and the North Coorong Lagoon. These cumulative impacts have reduced habitat and adversely affected the food chain (Paton 1997).

Sand build-up reached a critical level in mid-2002 following an extended period of barrage closure (630) days. This led the South Australian State Government to undertake a sand dredging program at the Murray Mouth from 2002 until 2010. While sand dredging is an effective tool to maintain an open Murray Mouth during low flow periods, natural flows are essential for this to occur naturally and maintain an 'open Murray Mouth', with adequate tidal variations to meet the needs of the Coorong ecosystem (DWLBC 2007).

Groundwater

The Coorong and Lower Lakes are located in the south-western edge of the Murray Geological Basin. The significant aquifers (or geological formations which hold water) in this region are Quaternary and Murray group Limestone sequences, and the deeper confined Renmark Group sand, which are separated by a series of confining clays aquitards (Brandle 2002), the Murray aquifer being used for irrigation in the Angas Bremer region. The limestone sequences are in good hydraulic connection forming a shallow watertable aquifer in the region (Barnett 1994).

Groundwater flows radially from the zone of recharge to the east of the site, discharging to the Coorong, the Lower Lakes or low-lying salinised areas (Barnett, 1994). On the western side of Lake Alexandrina, the watertable is within a Quaternary clay which overlies and semi-confines the limestone aquifer. Elsewhere in low-lying areas around the Lower Lakes, the watertable occurs in organic-rich clays (Haese et al. 2008) and contain highly saline groundwater (>100 000 mg per L). These areas are the focus for regional groundwater discharge in preference to the Lower Lakes which are at a higher level of 0.75 m AHD. As such, groundwater inflow volumes to the lakes are believed to be negligible compared with river inflows (Heneker 2010).

A groundwater-seawater conceptual model has been developed for the Coorong (Von Der Borch et al 1975) explaining the occurrence of ephemeral lakes and freshwater-dependent vegetation communities ('soaks') in the region (Haese et al. 2008). Groundwater discharge is believed to be widespread in the south lagoon of the Coorong judging by the distribution and abundance of features such as tufa, stranded pools, and active seeps, however it remains unknown what its impact on water quality in the Coorong is (Haese et al. 2008). Dryland salinity in the region is a major land degradation problem on the low-lying coastal plain, where clearing of native vegetation has led to a rising watertable (Haese et al. 2008).

In addition to these groundwater inputs, there are surface water inflows into the South Lagoon from the Upper South East drainage scheme via Salt Creek. This drainage scheme intercepts groundwater and surface water from South East of South Australia.

Water Quality

Lake Alexandrina is a freshwater system, with salinity usually varying between 400 and 1500 electrical conductivity units (EC) (Heneker 2010). Salinity in Lake Alexandrina is primarily controlled by lake inflows from the River Murray and Eastern Mount Lofty Ranges' (EMLR) tributaries, and outflows through the barrages (Heneker 2010).

Lake Alexandrina is also the primary source of freshwater into Lake Albert. Lake Albert acts as a sink for salt and sediment for inflows from the River Murray and groundwater (Phillips and Muller 2006). As a terminal lake it has no through-flow mechanism and consequently is more saline than Lake Alexandrina (typically ranging between 1000 and 2300 EC, but can be higher) (Heneker 2010). The Lakes are also considered to be eutrophic and marginal environment for phytoplankton growth because they are highly turbid and most nutrients are not in bio-available forms (Geddes 1984).

The Murray Mouth estuary in average years is naturally estuarine but salinity levels fluctuate depending on outflows and which barrage structures are used for releases. The estuary is 'protected' from the high-energy marine environment of the Southern Ocean by the Sir Richard and Younghusband Peninsulas. Salinity levels fluctuate widely when there is flow across the barrages. When flow ceases a salinity gradient from seawater at the mouth, to hypersaline conditions in the Northern Lagoon, develops (Lester et al. 2011).

The salinity regime in the Coorong is typical of a 'reverse estuary' where salinity increases (from estuarine to hypersaline) further from the estuary mouth. Salinity in the South Lagoon is controlled by the exchange of water with the North Lagoon, rainfall on the lagoon surface, evaporation, openness of the Murray Mouth, the depth of channels at Hells Gate, and inflows from Salt Creek (from the USED scheme).

A historical nutrient budget for the Lakes found they were consistently a sink for Phosphorus, nitrate-nitrite and Silicon, but an overall source of organic forms of Nitrogen (Cook et al. 2008), with water levels and salinity controlling the cycling of nutrients within the Lakes (Brookes et al. 2009). The Lakes convert inorganic nutrients into organic forms and so increasing productivity within the site (Brookes et al. 2009). The Lakes are also a significant modulator of material entering the Coorong, increasing the Nitrogen to Phosphorus ratio of material (Brookes et al. 2009). Upon flow into the Coorong this is likely to stimulate productivity since coastal waters are generally considered to be limited by Nitrogen (Brookes et al. 2009).

Inflows from the River Murray from the Lakes barrages have a strong impact on biogeochemical processes in the Coorong by bringing large amounts of new nutrients into the system (Brookes et al. 2009). Modelled nutrient budgets in the Coorong found that while much of the Riverine nutrient input goes directly to sea, some bioavailable nutrients are retained in the North Lagoon, and they are subsequently released and redistributed to the South Lagoon over time (Grigg et al. 2009). Total concentrations of macronutrients (Phosphorus and Nitrogen) can vary markedly along the length of the Coorong, with maximum concentrations in the South Lagoon in summer due to evaporation (Brookes et al. 2009). Biogeochemical processes therefore modulate the quantity and types of organic matter in the Coorong and thus markedly influence the ecosystem structure (and productivity) (Brookes et al. 2009).

Geology

The Coorong and Lakes Alexandrina and Albert are located in the south-western edge of the Murray Geological Basin. The significant aquifers (or geological formations which hold water) in this region are Quaternary and Murray group Limestone sequences, and the deeper confined Renmark Group sand, which are separated by a series of confining clays aquitards (Brandle 2002). The dominant unit is 'Lake' and the subdominant is 'Plain' (incorporating Hindmarsh Island) which is dissected with seasonal streams. Soils of the plains are described as poorly drained, black, self-mulching cracking clays (Brandle 2002). The Coorong is dominated by yellow-grey calcareous sands and occurrence of mudflats (Brandle 2002).

Both Lake Alexandrina and Lake Albert have potentially high levels of acid sulfate soils (Fitzpatrick et al. 2008a, 2008b, 2009). Water levels in the Lower Lakes below 0.0 m AHD will expose ASS, creating the potential for pH to decline below Australian and New Zealand Environment Conservation Council guideline levels (ANZECC 2000). This has implications for the maintenance of the ecological character of the water body and individual wetlands. If low water levels allowed sufficient acidification of ASS in the lakes for the alkalinity buffer in the remaining lake water to be lost, and the pH shifted below 6.5, then a suite of flora and fauna could be put at risk.

17. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type).

The Coorong and Lakes Alexandrina and Albert Wetland is located at the downstream end of the Murray-Darling Basin system; Australia's largest river basin covering approximately

1,058,800 km^2 (Kahrimanis et al. 2001). The South Australian portion of the Murray-Darling Basin encompasses an area of about 70,000 km^2 (Kahrimanis et al. 2001). The River Murray terminates at the Southern Ocean in South Australia where is passes through Lakes Alexandrina and Albert, the Murray estuary, and then into the ocean through the Murray Mouth or into the Coorong.

The climate is cool and relatively moist in the far south of the South Australian portion of the Murray-Darling Basin, with an average annual rainfall of 450 mm around the south-eastern areas (Kahrimanis et al. 2001). Further north in the Murray Mallee the climate becomes semi-arid with a decrease in rainfall to 250 mm in the upper reaches of the SA Murray region (Kahrimanis et al. 2001). The climate of the Eastern Mount Lofty Ranges and foothills is cooler and wetter than the Murray Mallee/Murray Plains, with rainfall averaging 450 to 550 mm (Kahrimanis et al. 2001).

Major landforms in the Murray Mallee and Murray Plains include the active dune system of the Coorong, the beach ridge-dune complex inland of the coastal dunes and the vast rolling plains of the lower Murray area (Kahrimanis et al. 2001). The soils of the Murray Mallee and Murray Plains are primarily a mixture of shallow, well-drained calcareous earths; shallow or deep, well-drained uniform sands; deep, imperfectly drained yellow duplex soils; and moderately deep, imperfectly drained yellow duplex soils (Kahrimanis et al. 2001).

18. Hydrological values

Describe the values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

Section 16 above provides a summary of important surface water and groundwater features within the site.

River regulation, water extraction and the recent drought have reduced the total volume of water available to the river and Coorong Estuary, and have significantly altered the natural pattern of remaining flows. These changes have resulted in a substantial decline in the health of the river.

The site has been identified as providing a range of regulating services including flood mitigation, groundwater recharge, water purification, sediment retardation and retention, sequestration of carbon and biological control of pests and diseases (Phillips and Muller, 2006) although quantification and substantiation of these services has not yet been attempted at a site scale.

19. Wetland Types

a) presence:

Circle or underline the applicable codes for the wetland types of the Ramsar "Classification System for Wetland Type" present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines*.

Marine/coastal: **A** • **B** • **C** • **D** • **E** • **F** • **G** • **H** • **I** • **J** • **K** • **Zk(a)**

Inland: **L** • **M** • **N** • **O** • **P** • **Q** • **R** • **Sp** • **Ss** • **Tp** • **Ts** • **U** • **Va** • **Vt** • **W** • **Xf** • **Xp** • **Y** • **Zg** • **Zk(b)**

Human-made: **1** • **2** • **3** • **4** • **5** • **6** • **7** • **8** • **9** • **Zk(c)**

b) dominance:

List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

O, J, W, Tp, G, F, R, Xf, 4, Ts, E, D, H, M, N, P, A, 9, K, Y, I and 6.

20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

Lakes Alexandrina and Albert

The Lakes are broad and shallow systems with unique and extensive fringing emergent vegetation with the most complex wetland flora found near the confluences of inflowing water bodies (e.g. creeks, drains) and islands. Fringing emergent vegetation has increased its distribution but has been simplified since the installation and operation of the barrages whilst communities dependent on variable water regimes have become restricted in their distribution (Phillips and Muller 2006). Freshwater submerged aquatic plant communities were once extensive in the lakes system (Sim and Muller 2004) but are now restricted to near-shore habitats with good light penetration and low turbidity. These plant communities provide habitat and architecture, physico-chemical components and processes and act as the starting blocks for the food web in the site (Phillips and Muller 2006).

Many fringing wetlands around the Lower Lakes also support lignum (*Muehlenbeckia florulenta*) and samphire (e.g. *Sarcocornia* spp.) above the high water level in addition to the aquatic and emergent plants. There are also remnant areas of Swamp Paperbark (*Melaleuca halmaturorum*) patchily distributed around Lakes Alexandrina and Albert (Marsland and Nicol 2009). The EPBC-listed Southern Bell Frog (*Litoria raniformis*) inhabits fringing wetlands of Lake Alexandrina, with known populations in Pelican Lagoon, Clayton Bay and Hindmarsh Island channels (Mason 2010; Mason and Hillyard 2011).

Hindmarsh, Mundoo, Ewe and Tauwitchere Islands lie within a transitional zone between Lake Alexandrina and the Coorong. These island areas comprise unique vegetation communities. The freshwater habitats on, and immediately surrounding the islands are critical habitats for fish, particularly EPBC-listed small-bodied native fish such as Murray Hardyhead (*Craterocephalus fluviatilis*) and Yarra Pygmy Perch (*Nannoperca obscura*). These transitional zones provide important ecological connectivity for migration of diadromous fish species such as Congolli (*Pseudaphritis urvillii*) and Common Galaxias (*Galaxias maculatus*).

The area around Hindmarsh, Mundoo, Ewe and Tauwitchere Islands are also where mudflats would have occurred before river regulation stabilised water levels. Mudflats in this area are now exposed over short time scales by wind seiching events and act as habitat for wading birds.

Eastern Mount Lofty Ranges Tributaries

The lower reaches of the Finniss River, and Tookayerta and Currency Creeks are structurally diverse and support dense and diverse wetland habitats ranging from woodlands (e.g. River Red Gum (*Eucalyptus camaldulensis*)) to peat bogs. These areas also form part of the EPBC-listed 'Swamps of the Fleurieu Peninsula' ecological community and provide habitat for endangered species such as the Mount Lofty Ranges Southern Emu-Wren (*Stipiturus malachurus intermedius*) (Phillips and Muller 2006).

In drought years, these tributaries act as critical refugia for many fishes and other species dependent on freshwater including the State-listed River Blackfish (*Gadopsis marmoratus*) and the nationally-listed Yarra Pygmy Perch (*Nannoperca obscura*) and Southern Bell Frog (*Litoria raniformis*) (DEH 2010a; Mason 2010).

Murray Mouth

The lagoon environment of the estuary (from the Goolwa Barrage to Pelican Point) includes habitats such as exposed mudflats and shallow waters, which provide important foraging

grounds for many wader bird species. In the past the vegetation community was dominated by *Ruppia megacarpa,* though this has not been present since 1986 (G. Hera-Singh, pers. comm.), nor has it been recorded in the entire Coorong for a number of years (Nicol 2005).

An open Murray Mouth is critical for maintaining water quality in the estuary (through tidal exchange) and Coorong under zero and low flow conditions (see Hemming, Trevorrow and Rigney 2002). Tidal variations also facilitate daily inundation and exposure of mudflats, thereby maintaining invertebrate productivity and biomass in these areas (Dittmann et al. 2010). An open Murray Mouth is critical as the Murray Mouth is the only path by which pollutants such as salt can be flushed from the entire Murray-Darling Basin, and biota such as diadromous fish can enter and exit the Basin to complete their lifecycles (Higham 2012).

The Coorong

The Coorong is highly regarded for its diversity and abundance of waterbirds (Wainwright and Christie 2008; Paton et al. 2009). Historically, the North Lagoon was mainly estuarine and provided rich, sheltered waters for fish and provided the necessary lifecycle cues required for aquatic seed germination, fish passage, breeding and foraging. *Ruppia megacarpa* was the dominant plant species while *Laprothamnium* and *Lepilaena* are also believed to have been historically part of the complex of aquatic plant species (Phillips and Muller 2006).

Evidence suggests the South Lagoon was historically fresher than its current hypersaline state (Krull et al. 2009), and was freshened by winter/spring flows predominately from the South-east of South Australia. Increased salinity and unfavourable water levels in the South Lagoon over recent years, brought about by low freshwater inflows, have led to the loss or decline of keystone species such as *Ruppia tuberosa*, chironomids and Small-mouthed Hardyheads (*Atherinosoma microstoma*) (Paton and Bailey 2010). *Ruppia* spp. Provide a food resource for water fowl, shelter for macroinvertebrates and fish and provide detritus to 'fuel' decomposition and thus nutrient cycling and carbon cycling (Phillips and Muller 2006).

21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14, Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS*.

The Lakes are broad and shallow systems with unique and extensive fringing emergent vegetation. Much of the fringing vegetation is dominated by *Phragmites australis* with the most complex wetland flora found near the confluences of inflowing water bodies (e.g. creeks, drains) and islands. Fringing emergent vegetation has been simplified since the installation and operation of the barrages. Emergent macrophyte communities have thrived whilst communities dependent on variable water regimes have become restricted in their distribution (Phillips and Muller 2006).

Freshwater submerged aquatic plant communities were once extensive in the lakes system (Sim and Muller 2004) but are now restricted to near-shore habitats with good light penetration and low turbidity. Aquatic plant communities included species such as Ribbon Weed (*Vallisneria australis*), Water Ribbons (*Triglochin procerum*), Pondweeds (*Potamogeton* spp.) and Milfoils (*Myriophyllum* spp.). Submerged aquatic plants are now dominated by *Potamogeton* spp.*, Ruppia* spp. and various types of charophytes; however, there has been an increase in abundance of *Myriophyllum salsugineum, Vallisneria australis* and *Triglochin procerum* since water levels were reinstated (Gehrig et al. 2011).

Many fringing wetlands around the Lakes also support Lignum (*Muehlenbeckia florulenta*) and Samphire (e.g. *Sarcocornia* spp.) above the high water level. There are also remnant areas of Swamp Paperbark (*Melaleuca halmaturorum*) patchily distributed around Lakes Alexandrina and Albert (Marsland and Nicol 2009).

The lower reaches of the Finniss River, and Tookayerta and Currency Creeks are structurally diverse and support dense and diverse wetland habitats ranging from woodlands (e.g. River Red Gum (*Eucalyptus camaldulensis*)) to peat bogs. These areas also form part of the EPBC-listed 'Swamps of the Fleurieu Peninsula' ecological community.

The lagoon environment of the estuary (from the Goolwa Barrage to Pelican Point) includes habitats such as exposed mudflats and shallow waters, which provide important foraging grounds for many wader bird species. In the past the vegetation community was dominated by *Ruppia megacarpa*, though this has not been present since 1986 (G. Hera-Singh, pers. comm.), nor has it been recorded in the entire Coorong for a number of years (Nicol 2005). Increased salinity and unfavourable water levels in the South Lagoon over recent years, brought about by low freshwater inflows, have led to the loss of keystone species such as *Ruppia tuberosa* (Paton and Bailey 2010).

17 weed species have been identified as posing the most significant threat to the Lakes region of the Ramsar site (Bonifacio et al. 2011). These include the weed species of Athel Pine (*Tamarix aphylla*), Boneseed (*Chrysanthermoides monilifera*) and Prickly Pear (*Opuntia sp.*).

21 weed species were short-listed as posing the most significant threat to the Coorong region of the Ramsar site (Bonifacio et al. 2011). These include the weed species of Boneseed (*Chrysanthermoides monilifera*) , Athel Pine (*Tamarix aphylla*), Coastal Tea-tree (*Leptospermum laevigatum*), Spiny Rush (*Juncus acutus*), Tamarisk (*Tamarix ramosissima*) and Dolichos Pea (*Dipogon lignosus*).

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22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

The Ramsar site is considered to be an important biodiversity hotspot, renowned for providing habitat for many waterbird species, nationally threatened species, and all living things in the region are Ngarrindjeri ngartjis (totem – or closest friend).

The Ramsar sites supports a remarkable abundance of waterbirds in terms of overall waterbird numbers as well as numbers of individual species (refer to Criteria 5 and 6 above). Noteworthy fauna also include threatened species (refer to Criterion 2 above), endemic species (refer to Criterion 3 above) and species in significant numbers (refer to Criteria 5, 7 and 8). Additional noteworthy fauna include the following:

- Mudflat habitats (benthic invertebrates such as the mottled shore crab, polychaete worms, amphipods and chironomid larvae) are key food resources for resident and migratory birds of the Ramsar site.
- Pondi (Murray Cod) are regarded by the Ngarrindjeri people as the first fish in the Kaldowinyeri (the Creation); there are important cultural and spiritual values associated with Pondi. Mulloway are an important food source for Ngarrindjeri people (although opportunities for Ngarrindjeri people to use traditional fishing methods for catching

Mulloway have reduced). The Ramsar site is also a nesting place for Kungari, the black swan, whose eggs are a regular part of the diet of many Ngarrindjeri people.

Other noteworthy fauna species include the following conservation significant species:

Common name	Scientific name	IUCN Status	National Status	South Australian
Swamp Rat	*Rattus lutreolus*	Least Concern		Rare
Murray Turtle	*Emydura macquarii*			Vulnerable
Yellow-bellied Water Skink	*Eulamprus heatwolei*	Least Concern		Rare
Heath Goanna	*Varanus rosenbergi*			Vulnerable

8 animal pest species have been identified as posing the most significant threat to the Ramsar site (Bonifacio et al. 2011). These include the Rabbit (*Oryctolagus cuniculus*), Red Fox (*Vulpes vulpes*), feral cat (*Felis catus*), feral goat *(Capra hircus*), Fallow Deer *(Dama dama*) and Red Deer (*Cervus elaphus*).

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23. Social and cultural values:

a) Describe if the site has any general social and/or cultural values e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values:

The site supports a range of economic industries including irrigated and dryland agriculture; commercial fishing; boat building and maintenance; tourism and recreation activity; and manufacturing industries centred on wine, machinery and equipment. All rely on the ecological health of the site for their wealth. A healthy Lakes and Coorong ecosystem ensures the existence of large and viable fish populations for commercial and recreational fishing, good quality water for irrigation, healthy bird numbers for ornithologists, and aesthetically attractive and pleasing environment for people to enjoy (DfW 2012). There is social value and willingness to pay for improvements in the water quality in the Murray River and Coorong, and improved water bird habitat in the Coorong (Hatton and MacDonald et al. 2011)

The recent drought conditions have seen restructuring of regional industries with changes impacting on all industries in the region. There has been a reduction in the number of dairying farms and a reduction in livestock numbers. Wine production and irrigation industries have been affected by drought, water quality issues and water availability. Water security for irrigation and wine industries has been improved following construction of the Lower Lakes irrigation pipeline in 2009. Pipelines have also been completed to communities in the Lower Lakes and Coorong region for stock and domestic purposes to reduce dependence on the Lower Lakes as a water supply (DEH 2010b). Impacts have also been detected in other agricultural industries as well as the fishing, tourism and boating industries. The easing of recent drought conditions (since 2010) has seen an improvement in the outlook for Lower Lakes and Coorong communities.

Lakes and Coorong Fishery

Recreationally significant species include Mulloway and Yellow-eye Mullet (PIRSA 2011). The commercial fishery within the Ramsar site is a multi-species and multi-method fishery, with

primary target species including Mulloway, Yellow-eye Mullet, Greenback Flounder (*Rhombosolea tapirina*), Black Bream (*Acanthopagrus butcheri*), and Golden Perch (*Macquaria ambigua*) (Sloan 2005).

Other benefits
Conservation, recreation: camping, boating, duck hunting (not over entire area; in game reserve only), fishing, cockling, water storage and extraction, grazing and cropping, and urban/residential development. Phillips and Muller (2006) highlight the list of services and benefits believed to be provided by the site.

Ngarrindjeri Ruwe/Ruwar (lands, waters, people and all living things)
The Lower Lakes, Murray Mouth and Coorong region is central to Ngarrindjeri culture and spiritual beliefs. This association is expressed through Creation stories (cultural and spiritual histories) about Yarluwar-Ruwe (Sea Country) which reveals the significance of the relationship between the country and the people, both practically and spiritually. For the Ngarrindjeri the lands, waters and all living things are socially, culturally, spiritually and economically valuable. For the non-Indigenous community these values are often translated into significances such as archaeological and historical. According to this way of defining significance and value the Ramsar site has many places/sites of importance historically, archaeologically and anthropologically.

The Ngarrindjeri people as descendants of the original indigenous inhabitants of the lands and waters of the Murray River, Lower Lakes and Coorong and adjacent areas assert their traditional rights to their lands and waters by the continuation of their culture upon their traditional lands and the right to pursue their economic, social, and cultural development. The Ngarrindjeri people are the Traditional Owners of the land and according to their traditions, customs and spiritual beliefs its lands and waters remain their traditional country.

The Ngarrindjeri want a future for the Coorong, Lower Lakes and Murray Mouth that maintains the continuation of their culture upon country, the national and international importance of the site, and that it continues to give life to the 4,000 Ngarrindjeri people who live and work in the region and to all Ngarrindjeri people. The Ngarrindjeri Vision for Country is outlined below:

> Our Lands, Our Waters, Our People, All Living Things are connected. We implore people to respect our Ruwe (Country) as it was created in the Kaldowinyeri (the creation). We long for sparkling, clean waters, healthy land and people and all living things. We long for the Yarluwar-Ruwe (Sea Country) of our ancestors. Our vision is all people Caring, Sharing, Knowing and Respecting the lands, the waters and all living things' (Ngarrindjeri Nation 2006).

The goals of the Ngarrindjeri people are:

- For our people, children and descendants to be healthy and to enjoy our healthy lands and waters
- To see our lands and waters healthy and spiritually alive
- For all our people to benefit from our equity in our lands and waters
- To see our closest friends – our Ngartjis (special animals) – healthy and spiritually alive
- For our people to continue to occupy and benefit from our lands and waters
- To see all people respecting our laws and living in harmony with our lands and waters.

(Ngarrindjeri Nation 2006)

The land and waters are a living body and the Ngarrindjeri are part of its existence. For the Ngarrindjeri to be healthy, the land and waters of the Coorong, Lower Lakes and Murray Mouth region must also be healthy. Human induced changes at the site and upstream along the River Murray post European settlement, combined with a drying of the land and waters, are causing the health of the region to change.

In 1998 Ngarrindjeri leaders described the cultural, social, economic and spiritual values of the Ramsar site in the following passage:

"The Ngarrindjeri are culturally and spiritually part of the Lower Murray, Lakes and Coorong region, and the Ngarrindjeri lands are crucial for the survival of the Ngarrindjeri people. The fish, birds and other living things are the Ngartjis (totems) of the Ngarrindjeri people, with which they have a strong spiritual connection and a responsibility to protect. This totemic relationship is deeply embedded in Ngarrindjeri culture and spirituality, and provides a unique perspective on Ramsar values and the maintenance of habitats." (Hemming, Trevorrow and Rigney 2002).

The Coorong and Lakes Alexandrina and Albert Wetland includes a registered Aboriginal heritage site – under the *Aboriginal Heritage Act 1988* (SA). The 'Meeting of the Waters'[6626-4727] site was registered in 2009 via a negotiated agreement with the South Australian Government. This site includes the waters and the bed of the lakes, river and estuary. Its spiritual and cultural significance is essential to the wellbeing and productivity of the Ngarrindjeri nation, Ngarrindjeri lands and waters and all living things (see Bell 1998, 2008; Ngarrindjeri Nation 2006).

The 'Meeting of the Waters' is significant through its uniqueness as a registered Aboriginal site (including the waters) at the mouth of one of the world's most important river systems, located in a Ramsar listed wetland. The long legal and political struggle to protect this site, often known as the Hindmarsh Island Bridge Affair, has been resolved through negotiation by the State Government and the Ngarrindjeri Nation. This resolution, and the complexity of the preceding struggle, has made the 'Meeting of the Waters' famous in international legal, historical, archaeological, anthropological and Indigenous contexts.

Ngarrindjeri describe the significance of the Meeting of the Waters in the following way:
The Meeting of the Waters is a fundamental aspect of the Ngarrindjeri world where all things are connected, whether they are living, from the past and/or for future generations. The Meeting of the Waters makes manifest core concepts of Ngarrindjeri culture that bind land, body, spirit, and story in an integrated, interfunctional world. The principles that flow from this cultural system are based upon respect for story, country, the old people, elders and family. The pursuit of these principles is contingent upon maintaining a relationship with country. The violation of these respect principles is manifest through the destruction of Ngarrindjeri Yarluwar-Ruwe (a concept that embodies the connectedness and interfunctionality of their culture) and their effect upon the behaviours and survival of ngatji (the animals, birds and fish). According to these principles and contingent beliefs the "environment" cannot be compartmentalised: the land is Ngarrindjeri and Ngarrindjeri are the land. All things are connected and interconnected. Ngarrindjeri philosophy is based on maintaining the integrity of the relationship between place and person. It is the responsibility of the living to maintain this continuity. The past is not and cannot be separated from the here and now or the future. To break connections between person and place is to violate Ngarrindjeri culture. The objective in undertaking activities upon Ngarrindjeri country should be to not cause violence to Ngarrindjeri culture.'

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?
If Yes, tick the box ☒ and describe this importance under one or more of the following categories:

i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:

ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:

iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:

iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

24. Land tenure/ownership:
a) within the Ramsar site:
The area is mostly Crown Land (water) and National Park and Game Reserves. Lakes Alexandrina and Albert are surrounded mainly by private property. The area is part of the traditional lands and waters of the Ngarrindjeri nation, the Ngarrindjeri & Ors (SAD 6027/98) native title claim, and includes registered Aboriginal sites such as the 'Meeting of the Waters'[6626-4727].

Statistics	**Old boundary**	**New Boundary**
Total Area	**139,210**	**142,530**
Land Owned - defined by Cadastre	59,440	62,840
Government Land	50,430	53,770
Crown Land – Minister for Environment and Conservation	49,780	53,060
Private Land	9,010	9,070
Water - Permanent	107,700	108,290
Water - Subject to Inundation	6,050	6,310
Water - Intermittent	170	220

b) in the surrounding area:
The Coorong is surrounded by National Park and Freehold Land. The Lakes and Tributaries are surrounded by Crown Land and Freehold land.

25. Current land (including water) use:
a) within the Ramsar site:
Conservation, recreation: camping, boating, duck hunting (not over entire area; in game reserve only), fishing, cockling, water storage and extraction, grazing and cropping, and urban/residential development.

b) in the surroundings/catchment:
Grazing and light farming in adjacent areas. Most of the edge of Lakes Alexandrina and Albert is used for farming, with tourist development in several areas. Development is otherwise restricted under the State Planning and other Acts and most of the area is in its natural state.

26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

Phillips and Muller (2006) identified a range of factors as having adverse effects on the ecological character of the site. The following provides a summary of key impacting factors and their relevance to the site.

a) within the Ramsar site and

- Water regime (current water management): River regulation, water extraction and occurrences of drought have reduced the total volume of water available to the site, and have significantly altered the natural pattern of remaining flows. Reduced flows from the River Murray, including insufficient flow size, flow frequency, duration and change to flow timing can have significant impacts on the ecological character of the site, including habitat connectivity and availability of aquatic ecological communities. River regulation and water extraction were management actions in place before the time of Ramsar listing.
- Water management structures: The operation of the barrages has significantly changed the hydrological regime of the Coorong and Lakes (DfW 2012). Water level management (via water management structures) can lead to the loss and/or decline of key aquatic vegetation and organisms, and key ecosystem processes. The barrages were in place before the time of Ramsar listing
- Water Quality (salinity): Increased salinities exceeding recommended salinity levels have been observed across the site. Salinity management is critical, with the impact of increased salinities leading to losses of key species, habitats and ecosystem processes within the site. Increased salinity and unfavourable water levels in the South Lagoon over recent years, brought about by low freshwater inflows, have led to the loss of keystone species such as *Ruppia tuberosa*, chironomids and Small-mouthed Hardyheads (*Atherinosoma microstoma*) (Paton and Bailey 2010).
- Pests (feral animal and weed management): Predation and competition exerted by pests can create a decline in wetland vegetation and organisms, habitat, water quality, and lower aquatic ecological community and waterbird breeding success.
- Climate change: Increased variability in climate, reduced water availability which can lead to the loss and/or decline of key aquatic vegetation and organisms, key ecosystem processes, decline in habitat and water quality.

b) in the surrounding area:

In addition to the threats within the Ramsar site, other activities around the site include agriculture and urban developments, and up-stream water diversions which can have significant detrimental impacts on the site.

27. Conservation measures taken:

a) List national and/or international category and legal status of protected areas, including boundary relationships with the Ramsar site:

In particular, if the site is partly or wholly a World Heritage Site and/or a UNESCO Biosphere Reserve, please give the names of the site under these designations.

In addition to being listed as a Ramsar site, the Coorong section of the Ramsar site is reserved as a National Park. The site is also subject to regional, state and national policies and legislation, and the JAMBA, CAMBA and ROKAMBA bilateral migratory bird agreements, and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). The Coorong is listed as a 'Shorebird Network Site' in the East Asian-Australasian Flyway Site Network, with the Network aiming to promote the conservation and wise use of sites which are of international importance to migratory shorebirds.

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate):

Ia ❑;Ib ❑; II ☒; III ❑; IV ❑; V ❑; VI ❑

c) Does an officially approved management plan exist; and is it being implemented?:

In 2000, the Coorong, and Lakes Alexandrina and Albert Ramsar Management Plan was adopted by the South Australian Government. The Plan includes a vision for the Coorong, and Lakes Alexandrina and Albert Wetland, identifies key threats to the wetlands, and suggests objectives and strategies to achieving the vision.

Under the Australian Government's The Living Murray program, the region has been identified as an icon site (the Lower Lakes, Coorong and Murray Mouth Icon Site) based on its high ecological, cultural, recreational, heritage and economic values. In 2006, the Living Murray Program released a management plan for the site, the 2006-07 Environmental Management Plan for the Lower Lakes, Coorong and Murray Mouth Icon Site. The Living Murray management plan focuses on providing a framework for managing water, and outlining actions to be undertaken during flow events. This management plan is currently being reviewed and updated. In addition, in 1990, the Coorong National Park Management Plan was prepared by the South Australian Government. This plan focuses solely on management of the Coorong National Park. The plan outlines proposals to manage and improve the Coorong National Park reserve. The Ngarrindjeri Nation [2006] has established a Sea Country Plan to identify long term conservation and management objectives for the site.

d) Describe any other current management practices:

Under (barrage) zero and low-flow conditions, water flow through the Murray Mouth is dominated by tidal flows.

The Long-Term Plan for the Coorong, Lower Lakes and Murray Mouth region (*Securing the Future: a long-term plan for the Coorong, Lower Lakes and Murray Mouth*) was developed as part of the South Australian Government's Murray Futures program, funded by the Australian Government's Water for the Future initiative. The Long-Term Plan aims to secure a future for the CLLMM region as a healthy, productive and resilient wetland system of international importance. A high level strategic cross agency Coorong, Lower Lakes and Murray Mouth Steering Committee has been established to provide coordination, advice and guidance in relation to existing and emerging policy issues and management actions in the region. This Committee can also provide reports direct to the Chief Executive of the South Australian Department of Environment, Water and Natural Resources and the South Australian Minister for Water and Minister for Sustainability, Environment and Conservation. A Governance Committee has also been established that provides a high level consultative forum at the senior-executive level between the South Australian Government and the Australian Government Department of Sustainability, Environment, Water, Population and Communities.

The South Australian *Natural Resources Management Act 2004* aims to assist in the achievement of ecologically sustainable development in the State by establishing an integrated scheme to promote the use and management of natural resources. The Act provides a mechanism for the creation of Natural Resource Management (NRM) regions, and for boards to oversee the management of each of these regions, with individual management plans. The Coorong, and

Lakes Alexandrina and Albert Wetland encompasses three NRM regions, including Adelaide and Mount Lofty Ranges, South Australian Murray-Darling Basin and South East. The Act requires persons to seek approval to undertake certain activities including water extraction licences and control measures around specified classes of plants and animals.

In managing fisheries resources, the South Australian Government has the primary responsibility of balancing optimum utilisation with the need to ensure long term resource sustainability. The *Fisheries Management Act 2007* provides for the conservation and management of South Australia's aquatic resources, including fisheries and aquatic reserves. The Act regulates fishing, including the provision of possession limits for specific species and penalties associated with over-fishing. Some fish not protected under the *EPBC Act* are protected under the State *Fisheries Management Act*. To facilitate better decision-making in South Australia's fisheries, a number of stakeholder-based fishery management committees have been established to provide expertise-based advice to the Government. The Inland Fisheries Management Committee is the principle forum established to allow for stakeholder input to the management of South Australia's inland fisheries, which includes the Lakes and Coorong Fishery. The Lakes and Coorong Fishery Management Plan (Sloan 2005) provides a framework to address key challenges facing the future management of the Lakes and Coorong Fishery.

Water for Good is a South Australian plan that ensures that there will always be enough water in South Australia. The Plan outlines the actions South Australia will take to ensure our water supplies are secure, safe, reliable – and able to sustain continued growth – for at least the next 40 years. The Plan enables South Australia to diversify water supplies to reduce reliance on the River Murray and other rain-dependent water sources. Restoring the health of the River Murray will still be crucial as it will continue to be an important source of water to supply regional cities and towns and irrigation industries. A healthy River Murray is also essential for a healthy environment and as a back up to Adelaide supplies.

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28. Conservation measures proposed but not yet implemented:
e.g. management plan in preparation; official proposal as a legally protected area, etc.

The *Water Act 2007* (Cth) established the Murray-Darling Basin Authority with functions and powers to ensure the Basin water resources are managed in an integrated, consistent and sustainable manner. The Water Act requires the Murray-Darling Basin Authority to prepare and oversee a Basin Plan. The Basin Plan 2012 is a legally enforceable document that provides for the integrated and sustainable management of water resources in the Basin. The Plan is an adaptive framework and will be rolled out over seven years to allow time for Basin states, communities and the Australian Government to work together to manage the changes required for a healthy working Basin. The Basin Plan includes specific water quality/quantity targets and outcomes for the Coorong, Lower Lakes and Murray Mouth. More information can be found at www.mdba.gov.au/what-we-do/basin-plan.

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29. Current scientific research and facilities:
e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

The Ramsar site provides a wide range of habitats and biota that present a diversity of opportunities for scientific research activities. Specific research projects on various aspects of the wetland are currently being undertaken through the Department of Environment, Water and Natural Resources, South Australian Murray-Darling Basin and South East Natural Resources Management Regions, Local Action Planning Groups, CSIRO, the South Australian EPA, and

various Universities. Some examples of the various areas of research are summarised in the table below.

Research/Monitoring area	**Description of research or monitoring (DfW 2012)**
Aquatic vegetation	Vegetation recruitment and extent monitoring in the Lakes, *Ruppia* extent and reproduction success in the Coorong.
Invertebrates	Benthic invertebrates and mudflats, aquatic invertebrates, zooplankton and diatoms; including analysis of communities (abundance and diversity) in relation to habitats, food availability and water regime.
Frogs	Species list – including status of populations of Southern Bell Frog around the Lakes and Tributaries.
Small-bodied threatened fish	Captive breeding, reintroductions and monitoring of Murray Hardyhead, Southern Pygmy Perch and Yarra Pygmy Perch.
Fish	Coorong fish diversity, abundance, distribution and recruitment; includes Icon Site target species (Black Bream, Greenback Flounder and Small-mouthed Hardyhead).
Birds	Aerial surveys, monthly and annual Lakes and Coorong surveys, wader census, breeding and cryptic waterbirds.
Ramsar Habitat Mapping	Compared condition of the Lakes (in 2010) with a condition assessment undertaken in 2003.
Acid Sulfate Soils (ASS)	Undertaken around the Lakes and Tributaries to assess the impacts of ASS exposed during low lake levels between 2006 and 2010.
Water Quality	Range of parameters (including pH, salinity, dissolved oxygen) in the Lakes and Coorong; includes surface water and groundwater monitoring and telemetered surface water monitoring stations

The Ngarrindjeri nation is collaborating with Australian and international research institutions and the South Australian government to investigate changes to natural resource management practices that respect Indigenous knowledge and methods as part of Caring for Country.

30. Current communications, education, participation and awareness (CEPA) activities related to or benefiting the site:

e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

Community Advisory Panel

A community advisory panel (the CAP) was established in early 2012 to provide advice and guidance on the implementation of the Long-Term Plan for the CLLMM region (the Long Term Plan is implementation through the CLLMM Recovery Project as part of the South Australian Government's *Murray Futures* Program, funded by the Australian Government's *Water for the Future* initiative). The Panel brings together a wide range of community knowledge and experience from various sectors in the CLLMM region to feed into the management of recovery projects. The first meeting of the CAP was held in Adelaide in April 2012 and was opened by the then Minister for Sustainability, Environment and Conservation.

CAP meetings, which are held every two months, have proven a useful opportunity for knowledge sharing between CLLMM community members and DEWNR staff. The focus is on developing and maintaining partnerships with the community, involving the community in decision making, having activities endorsed and supported by the community, and bringing community ideas (through CAP recommendations), back to the CLLMM Recovery Project for consideration.

In accordance with the IAP2 principles, the CAP enables community involvement, ownership and involvement in the decision making. The CAP assists in the promotion and facilitation of effective communication between the South Australian Government and local communities.

The Lakes Hubs

An example of the partnerships fostered by the CLLMM Recovery Project is the strong working relationship established with the Milang and Districts Community Association.

The Association has been involved from the start, being at the forefront of the community response to the drought.

The Association facilitates community involvement in the Program's activities, principally through the two shop-front Lakes Hubs at Milang and Meningie.

The first of two Community Hubs was established at Milang in 2009 under the auspices of the $10 million Lower Lakes Bioremediation and Revegetation Project, funded by the Australian Government with support from the South Australian Department of Environment, Water and Natural Resources. Since then the Community Hubs have been administered through that CLLMM Recovery Project with assistance from the CLLMM Partnerships team. In November 2010, a second Community Hub was launched in Meningie to provide the Lake Albert community with access to information about CLLMM Recovery Project projects underway around Lake Albert and the Coorong, as well as to encourage community involvement in local projects.

The Hubs were developed as a base for community engagement activities in the region and as a way of sharing information between government and the community. The Hubs:

- are the CLLMM Recovery Project's interface with the broader community. They enable information sharing, and create a mechanism for regular community feedback;
- are a central community point for mobilising volunteer support and coordinating on-ground works locally;
- provide training and employment for the community; and
- are the centre of community project development, linking into existing regional organisations, their initiatives and capacity.

These Community Hubs were established at the request and consensus of the community specifically for the CLLMM Recovery Project.

The Hubs have played a significant role in building bridges between the community and the government, and have become more than just information centres. The Hubs are a place where the community can be heard.

Vegetation Program

The Vegetation Program is being undertaken in the CLLMM region, as part of the CLLMM Recovery Project. The Vegetation Program was developed to support the restoration of ecological function, therefore contributing to a healthy and resilient wetland more able to adapt to changing water levels. Through key management actions, the program is protecting, enhancing and recreating valuable habitat to support diverse and viable populations of native plant and animal species maintaining the region's biological diversity.

Partnering with local communities:

- The program provides resources and support to increase the knowledge, skills and involvement of the people who were most affected by the recent ecological decline (particularly during 2006-2010) of the region. Through this investment the community will be better equipped to manage the region's environmental assets into the future.

Since the Vegetation Program's inception, 7 Community nurseries and 2 Ngarrindjeri Regional Authority (NRA) nurseries have collected seeds, propagated and grown over 2,733,580 plants which have been planted by over 40 community groups involved to date. This equates to 60,000 volunteer hours recorded.

Meningie Wetland

The Meningie Wetland project, a part of the CLLMM Recovery Project, is a restoration project on the Lake Albert foreshore at Meningie. Work has been done to stabilise the banks, increase flora and fauna, increase local and wider community knowledge of the management of acid sulfate soils, and improving lakefront amenity for the Meningie Township. This includes ongoing engagement with the community and Ngarrindjeri as well as continued support of the Friends of Meningie group.

In conjunction with a community reference group, Ngarrindjeri community, the Coorong District Council, and local school students, the Interpretive Trail was developed and installed in 2010-11. The Trail, named Pelican Path, includes a textured pathway, signage, seating, beach stabilisation seating, two viewing platforms and a bird hide.

The community planted approximately 2,500 locally native plants in the naturalised wetland corridor. A naturalised culvert will assist in filtering polluted stormwater runoff from Meningie before it enters Lake Albert.

The majority of the project site has now been planted by the Friends of Meningie group, the Ngarrindjeri, Meningie Area School students, and other Meningie community groups. The local community continues to be involved in site maintenance and monitoring.

Ngarrindjeri Partnerships

In 2009 the South Australian Government and the Ngarrindjeri people entered into the Kungun Ngarrindjeri Yunnan agreement (KNY) whereby the relevant Ministers on behalf of the Crown expressed a desire for a new relationship between the State of South Australia and Ngarrindjeri based on mutual respect and trust, acknowledging that Ngarrindjeri consider protection and maintenance of culture and cultural sites upon its land and waters central in every respect to Ngarrindjeri community wellbeing and existence (KNYA 2009).

31. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

The Ramsar site includes popular areas for recreational activities such as sightseeing, bird watching, camping, walking, fishing, swimming, canoeing, sailing, water-skiing, picnicking and four-wheel driving. The South Australian Tourism Commission estimated the number of visitors to the Coorong National Park in 2008 at about 138,000 (DEH 2010b).

The Coorong and Lakes are important for recreational boating and fishers due to the quality of the natural environment and the presence of species such as Mulloway (*Argyrosomus japonicus*) (MDBC 2006). There are also less tangible values important to both residents and visitors which are associated with the area's natural beauty with people holding a strong affinity with the site's aesthetics. Similarly there is also a perceived value in the area being listed as an "icon site" (MDBC 2006).

Tourism in the Fleurieu Peninsula region generates approximately $326 million a year and attracts about 652,000 overnight visitors during the year (DEH 2010b). The services sector, supporting tourism and primary production accounts for 8% of Gross Regional Product and 15% of all employment (DEH 2010b).

32. Jurisdiction:
Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.

Territorial Jurisdiction: South Australia
Functional Jurisdiction: Department of Environment, Water and Natural Resources

33. Management authority:
Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

The SA Department for Environment, Water and Natural Resources is the management authority responsible for the Ramsar site.

The South Australian Department of Environment, Water and Natural Resources
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A number of South Australian government agencies and organisations have specific responsibilities in relation to management of the Coorong, and Lakes Alexandrina and Albert Wetland.

The South Australian Department for Environment, Water and Natural Resources (DEWNR) has the lead role in the management of South Australia's water resources and advises the Government on the quantity, quality, use and availability of the State's water resources. DEWNR also has the lead responsibility for River Murray management including environmental water policy, planning and management. DEWNR has the key role in relation to The Living Murray Initiative and icon site management and is the primary point of contact with the Murray-Darling Basin Authority.

DEWNR also has the lead role in relation to natural resources management within the State and incorporates the Natural Resources Management Regions. DEWNR provides oversight of the Coorong and Lakes Alexandrina and Albert Ramsar Management Plan, the JAMBA, CAMBA and ROKAMBA agreements, and manages the Coorong National Park and Crown Lands within the region. DEWNR also has the lead responsibility in relation to the Coorong, Lower Lakes and Murray Mouth (CLLMM) Recovery Project.

SA Water manages MDBA River Murray assets in South Australia and physically operates and maintains the locks, weirs and barrages under direction from the MDBA, with input from DEWNR. The Department of Primary Industries and Regions South Australia (PIRSA) acts as the caretaker of fish resources in South Australia, through the Fisheries Division. The role of the division includes management and planning of the Coorong and Lakes fisheries.

Through the KNY, the Government provides support and resources to the Ngarrindjeri Regional Authority and enters into negotiations and consultations with the Ngarrindjeri about the maintenance and protection of Ngarrindjeri culture and cultural sites and the natural resources of the land. The KNY Taskforce meets monthly and provides an important

opportunity for engagement between Ngarrindjeri and South Australian Government agencies regarding a range of programs and projects relating to the site management.

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Scientific/technical references only. If biogeographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

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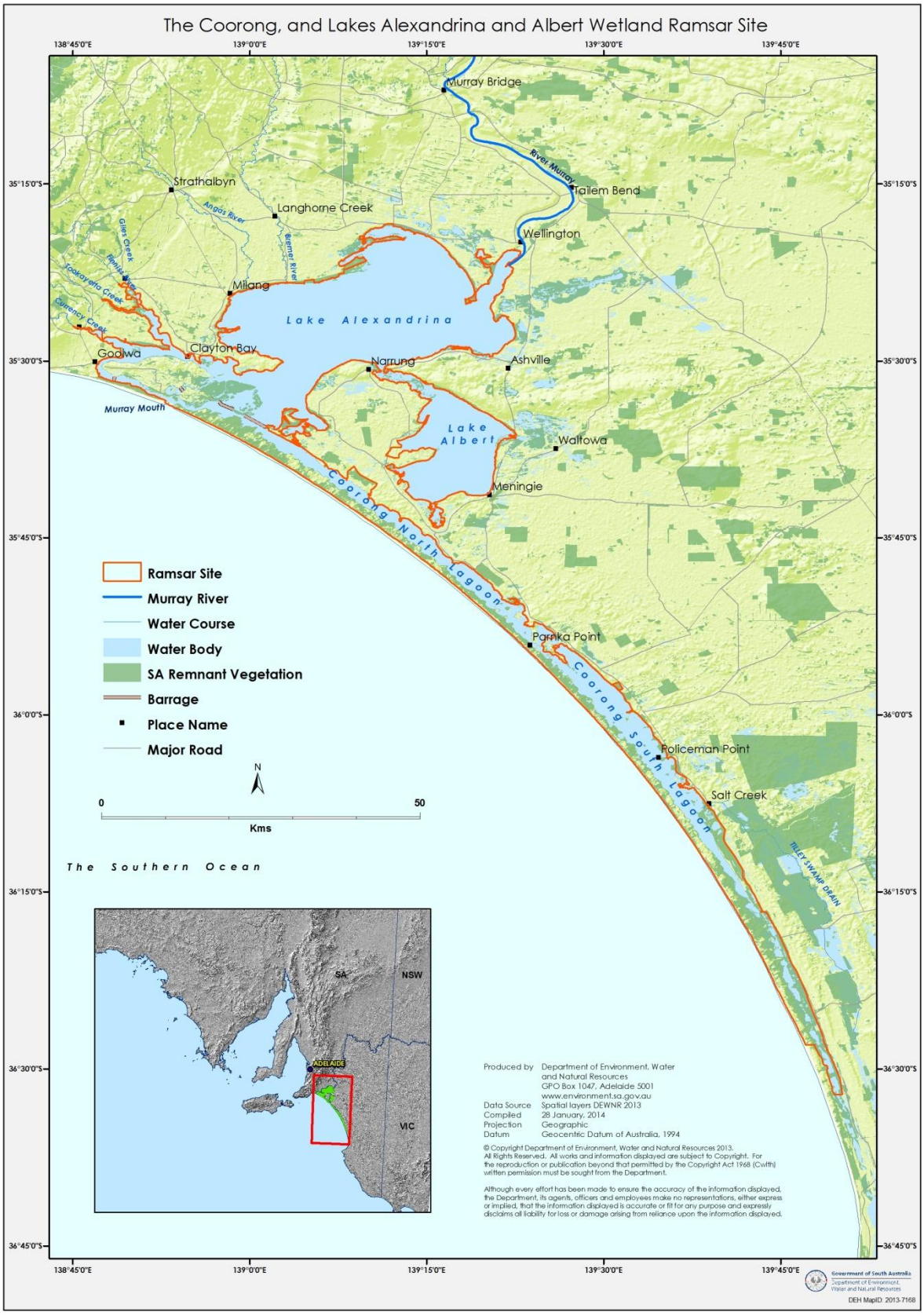

Figure 1. The Coorong and Lakes Alexandrina and Albert Ramar site.

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