

Information Sheet on Ramsar Wetlands (RIS) – 2009-2012 version

Available for download from http://www.ramsar.org/ris/key_ris_index.htm.

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).

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Designation date

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Site Reference Number

2. Date this sheet was completed/updated:

November 2009

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.

Banrock Station Wetland Complex

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

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:

The site has undergone a change in hydrological regime in 2007-2009. At listing the main wetland, Banrock Lagoon, site was a permanently inundated flow through floodplain wetland complex. This part of the site is now considered intermittent. Returning to a more natural water regime has promoted positive ecological changes, such as regeneration of many plant species and return of waterbird species that previously used the site. Under the guidance of the Ramsar Management Plan, the wetland was due to refill in late August 2007. However,, ongoing drought conditions in the Murray-Darling Basin led the South Australian Government to close 29 River Murray wetlands including Banrock Station wetland to reduce water losses through evaporation (Constellation Wines Australia 2008a).

In June 2008 the Banrock Lagoon was refilled after being dry for 18 months. The riparian River Red Gum community surrounding Banrock and Eastern Lagoons had not been inundated for a period of 2 and a half years (Sharley et al. 2009).

Six deep test wells were installed in and around Banrock and Eastern Lagoons to determine the availability of fresh groundwater to sustain the riparian vegetation. Results indicated flushed freshwater zones existed in a small area of Banrock Lagoon closest to the river and that in all other areas a thin film of freshwater (<15, 000 EC) only millimetres thick was underlain by highly saline groundwater within 2 m of the surface. This put most River Red Gums at risk of moisture and salt stress to their root zones (Sharley et al. 2009).

In May 2008 an environmental water allocation of 617 ML was granted by the Murray-Darling Basin Commission's The Living Murray Program. Banrock Station purchased an additional 215 ML for the refilling of the wetland. Refilling commenced in June 2008 in Banrock Lagoon to coincide with lowest period of evaporation losses, thus maximising the volume of water available to recharge the soil.

To date these have not affected the criteria for which the site was listed. However, since the previous RIS the Australian Government has shifted to using the Australian Drainage Division as the bioregionalisation approach for applying criterion 1 and 3. Until supporting data is collected and analysed at the scale of the drainage division it is not currently possible to determine if the site meets criterion 1. In addition the change in water management on site since 2007 has lead to a change in wetland types present. Wetland type O (Permanent freshwater lakes) no longer occurs at the site, being replaced by type P (Seasonal/intermittent freshwater lakes).

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.

Banrock Station Wetland Complex is bounded by three river bends and is adjacent to Weir and Lock 3 on the River Murray (located at 431.4 km - River Murray kilometers from the Mouth). The river boundary extends approximately 3.2 km upstream from Lock 3 and 11.5 km downstream.

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.

Latitude: 34° 11' South; Longitude: 140° 20' East

9. General location:

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

Banrock Station Wetland Complex lies on the floodplain of the south western side of the River Murray downstream from the township of Kingston on Murray, and opposite the township of Overland Corner, approximately 26 km North West of Berri in the Riverland of South Australia. The site straddles Lock 3 on the River Murray.

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

The floodplain wetland zone is 5 - 10 metres above sea level, the adjoining mallee buffer zone rises 40-50 metres above the floodplain, and the highest point on the site is 62 metres above sea level.

11. Area: (in hectares)

The Ramsar site covers 1, 375 ha which includes 1, 068 ha of floodplain and 307 ha of mallee, but excludes 426 ha of viticulture area.

12. General overview of the site:

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

Banrock Station Wetland Complex is a floodplain wetland complex typical of the lower River Murray floodplain. It comprises areas of freshwater and areas of secondary salinised floodplain with discrete wetland basins and channels. The site straddles the boundary of the Mallee Trench and Mallee Gorge geomorphic tracts of the River Murray. Within the Ramsar site boundary the wetlands exist as discrete depositional basins and active channels on an incised ancestral floodplain which is approximately 5-10 m above sea level.

The largest wetland basin is referred to as Banrock Lagoon. The Eastern Lagoon is joined to Banrock Lagoon during high flows and together forms the major freshwater wetland area of the site. Surrounding these lagoons are significant areas of samphire and lignum dominated floodplain, much of which is affected by rising saline groundwater. On the narrow floodplain within the Mallee Gorge geomorphic tract lie several intermittent wetlands which are not connected to Banrock and Eastern lagoons, and fill during moderate sized floods. The mallee highland areas of the site rise to 40-50 m above the floodplain with the highest point on the site being 62 m above sea level.

The dominant wetland vegetation types on the floodplain include River Red Gum (*Eucalyptus camaldulensis*) woodland, Black Box (*Eucalyptus largiflorens*) Woodland, Lignum (*Muehlenbeckia florulenta*) shrubland, Common Reed (*Phragmites australis*) and Narrow-leaf Bulrush (*Typha domingensis*) sedgeland. Aquatic herblands are present in Banrock Lagoon providing significant habitat value for aquatic biota.

The site adjoins a commercial viticulture enterprise which is managed in a manner complementary to conservation of the wetland. The nearby Wine and Wetland Centre promotes wetlands conservation and ecologically sustainable land use practices. Walking trails and boardwalks around the wetland provide interpretive information which explains the importance of the wetland, how the site has been rehabilitated and the principles and approaches to ecologically sustainable development. This

combination of wetland conservation and rehabilitation, with raising awareness of wetland values and functions, and private enterprise, is a good demonstration of the Ramsar wise use concept.

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 2: Banrock Station Wetland Complex supports two nationally listed species, the Vulnerable Regent Parrot (*Polytelis anthopeplus monarchoides*) and the Vulnerable Southern Bell Frog (*Litoria raniformis*). Currently there are no estimates on the size of the Southern Bell Frog population on site. The Regent Parrot colony found on site is one of the largest regional breeding colonies, with 100 nesting birds being recorded at the time of listing.

Table 1:

Scientific name	Common name	IUCN status	CMS status	CITES status	National Listing
<i>Polytelis anthopeplus monarchoides</i>	Regent Parrot	Least concern	-	-	Vulnerable
<i>Litoria raniformis</i>	Vulnerable Southern Bell Frog	Endangered	-	-	Vulnerable
<i>Notopala sublineata</i>	River snail	Endangered	-	-	-

River Snail (*Notopala hanleyi*) was once common in the wetlands of the lower River Murray and is now considered rare due to predation by introduced European Carp. With the reduction in the population of European Carp within the Banrock Station Wetland Complex, efforts are underway to re-introduce the River Snail. The early indications are that a breeding population is becoming established.

Lignum (*Muehlenbeckia florulenta*) Shrubland, is a threatened plant community in the South Australian Murray-Darling Basin, due to the impacts of grazing, un-natural water regimes and salinity (Kahrimanis et al. 2001). This plant community has recovered strongly within the Banrock Station Wetland Complex and is now a dominant part of the wetland ecosystem.

Common Reed (*Phragmites australis*) /Narrow-leaf Bulrush (*Typha domingensis*) Sedgeland communities are regionally threatened in the South Australian Murray-Darling Basin, and susceptible to threat from changed water regimes and grazing (Kahrimanis et al. 2001. Recognised for their importance as habitat for terrestrial and aquatic invertebrates, birds, fish and frogs, the reestablishment of these communities at the Banrock Station Wetland Complex offers a significant resource for biodiversity conservation in the region.

Criterion 3: This site supports the range of biological diversity (including habitat types) found in the region. The River Murray is 2,225 km from its headwaters to the Southern Ocean, traversing five distinct geomorphic regions. The site is located at the transition between two of these, the Mallee Trench and Mallee Gorge. This results in a large number of habitat types found in the lower part of the Murray-Darling Basin occurring in a relatively small area.

Within the Murray-Darling Depression biogeographic region, the majority of the river corridor including the floodplain wetlands has been subjected to altered flow regimes, salinity, overgrazing and introduced pest species. In the South Australian portion of the region, the river corridor is considered a “threatened habitat area” by Kahrimanis et al (2011). Seventy per cent of the Lower Murray wetlands have changed

from intermittent to permanently inundated. The Banrock Station Wetland Complex has been returned to intermittent inundation and a near-natural hydrological regime. As such, the Banrock Station Wetland Complex will play an increasingly important role as a biodiversity ‘reservoir’ for the region and will be a source of biodiversity for reintroductions and recolonisation of surrounding areas.

In the semi-arid environment in which it is found, the Banrock Station Wetland Complex offers a refuge during adverse conditions to sustain species’ populations during times of drought. The restoration of plant communities and wildlife habitats at the site will continue to support the reintroduction and recolonisation of displaced flora and fauna. The reintroduction of a near natural hydrological regime has favoured re-establishment of plant communities which are important for maintaining the biological diversity of the region.

Criterion 4: The Banrock Station Wetland Complex provides non-breeding habitat for migratory waterbirds listed under JAMBA, CAMBA and ROKAMBA agreements. However, the numbers of individuals are not large nor are most of the species recorded regular visitors. The exception is the Eastern Great Egret (*Ardea modesta*) which occurs at the site on a regular basis with records for eight of the past ten years. In addition, the site has also supported large numbers of moulting Australian Shelduck (*Tadorna tadornoides*) (M. Harper, DEH, pers. comm.), however, the frequency of moulting events has not been recorded and this remains a knowledge gap.

Table 2: The Banrock Station Wetland Complex provides seasonal habitat for migratory birds listed nationally and under the Bonn Convention, CAMBA, JAMBA and ROKAMBA agreements.

Common name	Scientific name	National listing (EPBC Act)	International
Australian White Ibis	<i>Threskiornis molucca</i>	Migratory	JAMBA
Glossy Ibis	<i>Plegadis falcinellus</i>	Migratory	CAMBA, JAMBA
Eastern Great Egret	<i>Ardea alba</i>	Migratory	CAMBA, JAMBA (listed as <i>A. alba</i>)
Common Greenshank	<i>Tringa nebularia</i>	Marine, Migratory	Bonn, CAMBA, JAMBA, ROKAMBA
Latham’s Snipe	<i>Gallinago hardwickii</i>	Marine, Migratory	Bonn, CAMBA, JAMBA, ROKAMBA
White-bellied Sea Eagle	<i>Haliaeetus leucogaster</i>	Marine , Migratory	CAMBA
Red-necked Stint	<i>Calidris ruficollis</i>	Marine, Migratory	Bonn, CAMBA, JAMBA, ROKAMBA
Wood Sandpiper	<i>Tringa glareola</i>	Marine, Migratory	Bonn, CAMBA, JAMBA, ROKAMBA
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	Marine, Migratory	Bonn, CAMBA, JAMBA, ROKAMBA
Caspian Tern	<i>Hydroprogne caspia</i>	Marine, Migratory	CAMBA, JAMBA
Fork-tailed Swift	<i>Apus pacificus</i>	Migratory	CAMBA, JAMBA, ROKAMBA
Red-capped Plover	<i>Charadrius ruficapillus</i>	Marine	
Red-necked Avocet	<i>Recurvirostra novaehollandiae</i>	Marine	
Musk Duck	<i>Biziura lobata</i>	Marine	

Lateral migration of small bodied native fish occurs via the inlet and outlet creeks, and the site may provide a downstream pathway around Lock 3 for large bodied fish in high flows. The relative importance of the site for fish migration in high flows has not been established.

Table 3: Fish species recorded at the Banrock Station Wetland Complex (Smith and Fleer 2007; Fredberg et al. 2009).

Common name	Scientific name
Small bodied natives	
Australian smelt	<i>Retropinna semoni</i>
Unspecked hardyhead	<i>Craterocephalus stercusmuscarum fulvus</i>
Carp gudgeons	<i>Hypseleotris spp</i>
Dwarf flat-headed gudgeon	<i>Philypnodon macrostomus</i>
Flat-headed Gudgeon	<i>Philypnodon grandiceps</i>
Murray River Rainbowfish	<i>Melanotaenia fluviatilis</i>
Bony Herring	<i>Nematalosa erebi</i>
Large bodied natives – juveniles only	
Freshwater Catfish	<i>Tandanus tandanus</i>
Golden Perch (Callop)	<i>Macquaria ambigua</i>

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:

Drainage Division IV: Murray-Darling Division (DEWHA 2007).

b) biogeographic regionalisation scheme (include reference citation):

Australia's River Basins (DEWHA 2007).

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.

Upstream of Banrock Station Wetland Complex the River Murray has cut through the Murray Group Limestone creating an extensive floodplain area (5-10 km wide) which narrows to a 1 km wide floodplain within the Mallee Gorge. The floodplain areas contain the highly conductive semi-confined Monoman Formation overlain by the Coonambidgal Formation. Banrock Station Wetland Complex lies at the junction of the Mallee Trench and Mallee Gorge geomorphic tracts of the River Murray. The main wetland areas were ephemeral prior to the construction of Lock 3 in 1925, at which time the wetland became permanently connected to the raised weir pool above Lock 3. Since 1992 control structures have allowed some manipulation of water levels within the system and in 2007 the wetland's water regime was returned to an intermittent inundation pattern with complete drying of the main wetland bed. The river and floodplains are discharge areas for regional groundwater which in general leads to an upward hydraulic gradient from the Murray Group to the Monoman Formation and Coonambidgal Formation (Crosbie et al. 2007). The groundwater is saline and secondary salinisation of areas of the floodplain has occurred within the boundary of the site.

Observations of the floodplain surface soils reveals that the alluvial soils of the floodplains comprise a grey cracking clay base (Coonambidgal Formation) overlying a coarse sand aquifer (Monoman Formation). The surface soils have been shaped by surface water processes including flooding and erosion, thereby creating a surface soil mix of sands, silts and clays of varying portions. Recent aeolian sand deposits have been blown onto the floodplain forming lunettes whose subsequent erosion has resulted in sand dispersion onto floodplain clays. Cliff face erosion has also resulted in sandy deposits over the floodplain soils.

Banrock Station Wetland Complex is a predominantly freshwater system and although salinity fluctuates (mainly reflecting changes in the River Murray source water), the system remains fresh at all times with electrical conductivity typically between 500 and 1000 $\mu\text{S}/\text{cm}$ (Olsen 1997; Tucker 2003). Turbidity at the time of listing ranged from 50 NTU to over 300 NTU (Olsen 1997; Tucker 2003). There is limited data on nutrient levels at the time of listing and currently, this remains a knowledge gap for the site.

The climate is relatively unpredictable with moderate to high inter-annual variation. The regional climate is characterised as semi-arid with warm to hot, dry summers and cool winters with variable rainfall. Approximately 80 % of the rainfall falls between May and October, with the highest monthly average rainfall between 17 - 21 mm per month. Total annual rainfall is approximately 260 mm per year. Temperatures are warm to hot in summer ranging from a minimum of 15.5° C to a maximum of 31.1° C. During winter temperatures are cooler with maximum temperatures of 15.2° C falling to a minimum of 5.3° C (data for Berri 1926-1963) (Bureau of Meteorology 2009). Total annual net evapotranspiration was calculated for Banrock Lagoon to be approximately 1300 mm (Gippel 2006).

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 following is extracted from the Riverland Ramsar site RIS (2009) as both sites lie within the same region of the Murray-Darling Basin.

The Murray-Darling Basin occurs within five states of Australia and has a surface area of 1.06 million square kilometres (14% of Australia). It covers 14 degrees of latitude (24 to 38 degrees South). The River Murray is 2,530km long from its source in the Australian Alps to its mouth. Banrock Station Wetland Complex is located near the lower end of the Basin, approximately 430 km from the river mouth. Much of the Basin is flat, with highlands occurring in the east and south where metamorphic and igneous rocks outcrop, providing the greatest relief in the Basin. Sandstones and other sedimentary rocks also outcrop in the Basin (Murray-Darling Basin Ministerial Council 1987). The Murray has five geomorphological tracts (Mackay and Eastburn 1990): The Headwaters: extending about 450 river km from the source. This tract is <2% of the Basin area, but contributes nearly 40% of the discharge. The Riverine Plains: a flat, 800 river km tract of river and lake deposits where the River Murray flows in shallow, branching, meandering channels. The Mallee Trench: an 850 river km plain of marine origin, crossed by the river in a well-defined incised channel. The Mallee Gorge: a 350 river km channel flanked by steep limestone cliffs. The Lakes and Coorong: including the terminal lakes, Lake Alexandrina and Albert, and the Coorong. This area also is a Ramsar site.

The Banrock Station Wetland Complex Ramsar Site straddles the boundary of the Mallee Trench and Mallee Gorge.

The plains of the Basin's southern rivers have poor grey and brown clay soils. These alluvial plains occupy one third of the Basin (Murray-Darling Basin Ministerial Council 1987).

Rainfall varies from over 1400mm per annum in the highlands to below 300mm in the west and northwest. Annual variability of rainfall increases inland. The regional climate is highly variable, with the occurrence of floods and drought an accepted natural phenomenon. Temperatures range from average summer maxima of over 30° C in the northwest, to winter maxima averaging less than 0° C in alpine areas. Except in alpine areas, potential evaporation far exceeds rainfall (Murray-Darling Basin Ministerial Council 1987).

18. Hydrological values:

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

This wetland has limited influence on the local hydrology. The wetland is believed to influence the local expression of groundwater, however, the degree to which the wetland operates as a recharge versus a

discharge site (depending on inundation levels) is still being investigated. The fact that the Banrock Lagoon is able to be dried to cracking soils indicates that the main wetland area may not be a significant discharge site.

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.

P, R, W, Xf, M, N (estimated) (current water regime is intermittent in the main wetland areas as opposed to permanent inundation at listing see section 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.

The Banrock Station Wetland Complex comprises two main ecosystem types: floodplain wetlands and the adjoining open mallee-box woodland community. The floodplain wetlands are dominated by River Red Gum (*Eucalyptus camaldulensis*), Black Box (*Eucalyptus largiflorens*), Lignum, Samphire and sedge and grassland communities. There are large expanses of open water when Banrock Lagoon is fully inundated. Eastern Lagoon is a Samphire dominated, salt affected, wetland and the Wigley Reach wetlands are predominantly intermittent wetlands with a Eucalyptus overstorey. Inlet and Banrock Creek provide flowing water habitat when connected to the river. The site provides habitat for a wide range of species including 61 species of waterbirds and several locally, regionally or nationally threatened species.

Prior to the re-introduction of wetting and drying cycles, and related management actions, the Banrock Station Wetland Complex was a highly degraded system and landscape. The rehabilitation of the site, which is ongoing, has seen the re-emergence of many plant species and the return of waterbird species that used the site previously. Active human intervention is also encouraging further re-establishment of vegetation communities.

The adjoining mallee-box woodland community is intimately linked to the floodplain wetland system. Species such as the vulnerable Regent Parrot depend on River Red Gums in the wetland (in which it breeds), and the adjacent mallee ecosystem for feeding. The Blue Mallee (*Eucalyptus cyanophylla*) Open mallee plant community found at Banrock Station is considered poorly conserved in South Australia (Neagle 1995).

Critical ecosystem services supplied by the site are all supporting services, including hydrological processes, physical habitat, biodiversity, ecological connectivity and threatened wetland species, habitats and ecosystems. A number of other ecosystem services are also provided by the site, with the cultural services, notably education and recreation, being particularly important.

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 dominant wetland vegetation types on the floodplain include River Red Gum (*Eucalyptus camaldulensis*) woodland, Black Box (*Eucalyptus largiflorens*) woodland, Lignum (*Muehlenbeckia florulenta*) shrubland, Common Reed (*Phragmites australis*) and Narrow-leaf Bulrush (*Typha domingensis*) sedgeland. Over 120 species of plants have been recorded on the site (data from Kuys and Clarke 2003; Constellations Wines Australia 2008; DEH unpublished). Species considered threatened in South Australia are presented in Appendix A.

In the mallee woodland ecosystem Blue Mallee (*Eucalyptus cyanophylla*), Red Mallee (*Eucalyptus oleosa*), Beaked Red Mallee (*Eucalyptus socialis*), Dryland Tea Tree (*Melaleuca lanceolata*), Umbrella Bush (*Acacia ligulata*), Oswald's Wattle (*Acacia oswaldii*) and Bullock Bush (*Alectryon oleifolius ssp. canescens*) are the dominant species with various *Maireana spp.* and other annual herbaceous and perennial grasses (Kuys and Clarke 2003). The vegetation association Blue Mallee (*Eucalyptus cyanophylla*), Open mallee (open scrub) with sparse sclerophyllous shrubs is endemic to the 'Mallee Block' where it is restricted to far north-western Victoria and the upper Murray Mallee in South Australia (Kahrimanis et al. 2001). This association is poorly conserved in South Australia and considered a high conservation priority (Kahrimanis et al. 2001).

Table 4: Introduced flora species

Common name	Scientific name
	<i>Aster</i> sp.
Spiny Rush	<i>Juncus acutus</i>
Noogoora Burr	<i>Xanthium occidentale</i>
Thistles	including <i>Onopordum acanthium</i>
Boneseed	<i>Chrysanthemoides monilifera ssp. Monilifera</i>
African Boxthorn	<i>Lycium ferocissimum</i>
Gazania	<i>Gazania linearis</i>
Salvation Jane	<i>Echium plantagineum</i>

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.*

A number of vertebrates recorded from the site are listed at the state level or are considered regionally important (see Appendix A). This includes the Freshwater Catfish (*Tandanus tandanus*) which is 'protected' in South Australia as well as the rare broad-shelled turtle (*Chelodina expansa*) (Fredberg et al. 2009). Freshwater Catfish are now extremely rare in South Australia and always found in low numbers. Bird records from Banrock Station Wetland Complex list 138 species (Birds Australia 2009; DEH unpublished). Fourteen species of waterbirds and wetland dependent birds recorded at Banrock Station Wetland Complex are listed as threatened species in South Australia (see Appendix A).

Banrock Station Wetland Complex supports a diverse number of woodland birds with over 85 species recorded at the site. Eight species are considered rare in South Australia (Appendix A). Seven native mammals, 14 species of reptiles and 8 amphibians have been also been recorded on the site.

Invasive species impacting the site include feral cats (*Felis catus*), Red Fox (*Vulpes vulpes*), European Rabbit (*Oryctolagus cuniculus*), European Hare (*Lepus europaeus*) and the Common Carp (*Cyprinus carpio*).

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 is recognised for its cultural significance to Indigenous Australians. Around the wetland are numerous indications of former habitation such as camp fires, stone implements and tools, shield and canoe trees.

In terms of the social and cultural significance of the wetland to the early European settlers in Australia, Banrock Station was formerly part of a larger holding called Thurk Station. Today there is a monument near the north-west boundary of the site which commemorates the spot where two South Australian policemen drowned while attempting to cross the River Murray in 1847.

The site has growing social significance for the region and the local community. The site provides a model or demonstration for how degraded floodplains, common along the River Murray, can be restored to productive ecosystems. This is an important social asset offered by the Banrock Station Wetland Complex.

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:

The site has high value as a demonstration site for the Ramsar concept of 'wise use' and provides for recreation, tourism, education and scientific research. Up to 100,000 people visit the site per year, which gives Constellation Wines Australia significant potential to showcase 'wise use'. The self-guided walks through the wetland and bird hides enhance the experience and serve to educate visitors.

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 Banrock Station Wetland Complex is Crown land under perpetual lease to Constellation Wines.

b) in the surrounding area: The Banrock Station Wetland Complex is bounded to the north-west, north and east by the River Murray. Land adjoining the site to the south and south-west is privately held. To the south-east, across the River Murray is the Loch Luna Game Reserve managed by the South

Australian Department of Environment and Heritage, and the Overland Corner floodplain managed by the National Trust of South Australia, and some smaller parcels of privately held land.

25. Current land (including water) use:

a) within the Ramsar site:

Conservation, education, science and recreation. At listing irrigation pumps extracted water from the main wetland, however, these were relocated to the River Murray in 2006.

b) in the surroundings/catchment:

Viticulture, irrigated perennial horticultural, conservation, cropping, residential, and some grazing of modified pastures. Agriculture is the dominant economic activity in the Basin, which is Australia's most important agriculture region. Most of the Basin's area is devoted to pastoral and dryland farming (sheep, cattle and grain crops). However, there are parts of the Basin where irrigation dominates the landscape and involves the growing of pasture, fodder and grain crops, cotton, and horticulture crops. Almost 75% of Australia's irrigated crops occur in the Murray-Darling Basin. Forestry, mining and electricity generation are also significant economic activities within the Basin. Irrigated agriculture is a major landuse in the Riverland region of South Australia.

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

a) within the Ramsar site:

Past Basin wide water management/use led to an alteration of the natural water regime resulting in loss of small to medium floods, altered ecological connectivity, loss of habitat diversity, facilitation of invasive species, and stressed riparian vegetation. Establishment of Lock 3 in 1925 resulted in the original ephemeral wetland system becoming permanently inundated, leading to River Red Gum death. Rising groundwater leading to salinisation of the floodplain has lead to severe stress in the riparian vegetation and establishment of Samphire vegetation associations.

Invasive species are a significant issue on site, particularly the Common Carp (*Cyprinus carpio*). Impacts of carp are known to include: predation on eggs and larvae of aquatic fauna species (including its own); feeding on seeds and seedling of native aquatic flora; competition for food resources; breeding and/or spawning habitat alteration for native fish; uprooting vegetation; increase of turbidity then anoxia (through prevention of solar light to reach bottom of wetland); and increase in organic material through excretion of fecal matter.

Sixty tonnes of Common Carp were removed from Banrock Lagoon in 1994 when the wetland was dried. Carp returned to the wetland as juveniles and underwent spawning and recruitment each year (Smith and Fleer 2007). Management of the water regime prior to the pumps being relocated from the main wetland may have favoured recruitment by lowering water levels in winter and raising them in spring. This water regime promoted floodplain grasses and vegetation to establish during winter months thus providing spawning and nursery habitat for carp in spring (Smith and Fleer 2007). Complete drying of the wetland in 2007 resulted in over 4,000 Common Carp perishing in Banrock Lagoon. Carp screens on the inlet and outlet creek combined with complete drying of the wetland bed will significantly reduce adult carp numbers within the system.

Shifting the water regime from permanent to intermittent may lead to the exposure of Acid Sulfate Soils. At present this is not considered a major threat. Impacts from recreation and tourism activities are well managed and considered minor. Irrigation for vineyard operations is closely monitored but has the potential to contribute to rising groundwater and associated ecological impacts.

b) in the surrounding area:

Water management and use, such as river regulation and irrigated cropping and horticulture are the most significant ongoing threats to the Ramsar site. Other catchment scale issues are deteriorating water quality and habitat degradation. Competition for water resources – Access to a water allocation for environmental purposes is critically important to ongoing rehabilitation of the Banrock Station Wetland Complex. Drought conditions in south-eastern Australia have been severe with water restrictions limiting access to environmental water allocations.

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.

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?:

Constellation Wines Australia (2008) Banrock Station Wetland Complex Wetland of International Importance. Ramsar site 1221, Management Plan 2008 to 2014. Revision June 2008. This management plan is being implemented.

d) Describe any other current management practices:

Basin/catchment management

- Development of, and implementation of the Water Act 2007; including establishment of the Murray-Darling Basin Authority and the development of the Basin Plan.
- Establishment of the Commonwealth Environmental Water Holder to manage Commonwealth water holdings in accordance with the environmental watering plan (a component of the Basin Plan).

Site management

- Improvements in water management/use e.g. irrigation offtake relocated.
- Site monitoring of water quality and biota in response to current watering regime.
- Revegetation work; improved habitat connectivity.
- Feral animal eradication and feral-free enclosures.

28. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

The following activities are planned:

Install a carp cage on the outlet creek in 2009/2010.

Investigate the feasibility of replacing/modifying existing control structures on inlet and outlet creeks to improve native fish passage.

Revegetation of 50 ha of mallee vegetation to reconnect isolated vegetation mallee associations.

Environmental water allocation to stressed River Red Gum communities on Wigley Reach.

29. Current scientific research and facilities:

e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

Several research organisations, Universities and government agencies are involved in research on site. In addition Banrock Station staff are actively involved in undertaking ecological monitoring and rehabilitation activities. The research has been focused on understanding floodplain ecology, drivers and stressors to the site, with the view of improved sustainable management of the site adopting wise use principals. Current activities include:

Groundwater monitoring

Tree health assessments

Species ecology – Southern Bell Frog population monitoring
Species breeding monitoring – Regent Parrot
Fish movement
Threatened flora surveys
Invasive species monitoring
Waterbird and woodland bird observations
Reptile and small mammal trapping
Restoration activities – vegetation planting

30. Current communications, education and public 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.

Banrock Station Wetland Complex includes the Wine and Wetland Centre which was designed to capture the imagination and interest of those that come to the site. Built in 1999 the design of the building, and its location overlooking the floodplain wetland, mallee woodland buffer zone and the grape growing areas focus visitors attention on the wetland and the concepts of wise use. Information panels within the Centre are designed to inform visitors and encourage them to take one of the walks available which will provide them with more detailed information about the site and its integrated management regime.

A series of self-guided walks were opened in May 2000 and a boardwalk trail was completed in 2001, which included information huts and 5 bird hides for observing waterbirds. Banrock Station offers four self-guided walks around the wetland; one of 2 kilometres, 4.5 kilometres and one of 8 kilometres around the main lagoon, with an additional 1 km section across the wetland bed when it is dry. Along the walking trails there are strategically placed Story Centres and Information Shelters which provide detailed information about the site.

Banrock Station Winery has produced a comprehensive, well illustrated, 90 page field guide to the property and Ramsar site. The guide introduces visitors to the sites Indigenous and European history, the management of the winery and describes in detail the ecology of 6 landscape zones found on site. The guide includes information on significant species as well as a list of flora and fauna and is designed to be used as an informative guide on the walking trails.

31. Current recreation and tourism:

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

Approximately 100,000 people visit the site per year. Recreation and tourism are a key feature of the site and activities have been done in a sustainable manner with location of boardwalks and trails being sensitive to maintaining the natural environment and minimising disturbance. The main activities are interpretive nature walk along designated trails.

32. Jurisdiction:

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

The Banrock Station Wetland Complex is privately managed under the guidance of the Department of Environment and Heritage South Australia.

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 day to day management of the site is the responsibility of the manager and staff of the Banrock Station Wine and Wetlands Centre.

Contact: Conservation & Wetland Manager, Banrock Station PO Box 346, Kingston-on-Murray, SA 5331
Tel +61 8 8583 0299, Fax +61 8 8583 0166

34. Bibliographical references:

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

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Please return to: **Ramsar Convention Secretariat, Rue Mauverney 28, CH-1196 Gland, Switzerland**
Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • e-mail: ramsar@ramsar.org

Appendix A: Listed species and communities of conservation significance at Banrock Station Wetland Complex

Plant species conservation status based on Baker et al. (2005) and regionally threatened communities based on Kahramanis et al. (2001). Data sourced from DEH (unpublished).

Bird records based on data supplied by Birds Australia (2009) and DEH (unpublished).

Fish conservation status at the State level is based on Hammer et al. (2007).

E = endangered, R = rare, V = vulnerable, E IUCN = globally endangered.

Group	Common Name	Scientific Name	National/ International	State
Waterbirds				
	Australasian Shoveler	<i>Anas rhynchos</i>		R
	Australasian Darter	<i>Anhinga novaehollandiae</i>		R
	Intermediate Egret	<i>Ardea intermedia</i>		R
	Musk Duck	<i>Biziura lobata</i>		R
	Little Egret	<i>Egretta garzetta</i>		R
	Latham's Snipe	<i>Gallinago hardwickii</i>		R
	Blue-billed Duck	<i>Oxyura australis</i>		R
	Great Crested Grebe	<i>Podiceps cristatus</i>		R
	Baillon's Crake	<i>Porzana pusilla</i>		R
	Spotless Crake	<i>Porzana tabuensis</i>		R
	Freckled Duck	<i>Stictonetta naevosa</i>		V
	Wood Sandpiper	<i>Tringa glareola</i>		R
Wetland associated non waterbirds				
	White-bellied Sea Eagle	<i>Haliaeetus leucogaster</i>		E
	Regent Parrot eastern	<i>Polytelis anthopeplus</i>	E	V
Woodland birds				
	Bush-stone Curlew	<i>Burbinus grallarius</i>		V
	Pink Cockatoo	<i>Cacatua leadbeateri</i>		V
	Golden-headed Cisticola	<i>Cisticola exilis</i>		R
	White-winged Chough	<i>Corcorax melanorhombos</i>		R
	Brown Quail	<i>Coturnix ypsilophora</i>		V
	Blue-faced honeyeater	<i>Entomyzon cyanotis</i>		R
	Peregrine Falcon	<i>Falco peregrinus</i>		R
	Major Mitchell Cockatoo	<i>Lophochroa leadbeateri</i>		V
	Restless Flycatcher	<i>Myiagra inquieta</i>		R

	Gilbert's Whistler	<i>Pachycephala inornata</i>		R
	Little Friarbird	<i>Philemon citreogularis</i>		R
	Striped Honeyeater	<i>Plectorhyncha lanceolata</i>		R
Fish				
	Freshwater catfish	<i>Tandanus tandanus</i>		E
Amphibians				
	Southern Bell Frog	<i>Litoria raniformis</i>	E IUCN, V	V
Mammals				
Introduced to the site	Brush-tailed Bettong	<i>Betongia penicillata</i>	E	
Introduced to the site	Greater Bilby	<i>Macrotis lagotis</i>	E	
	Common Brushtail Possum	<i>Trichosurus vulpecula</i>		R
Reptiles				
	Broad-shelled Tortoise	<i>Chelondina expansa</i>		V
	Lace Monitor (Tree Goanna)	<i>Varanus varius</i>		R
Plants				
	Swamp Daisy	<i>Brachyscome basaltica</i> var. <i>gracilis</i>		R
	Tufted Burr-Daisy	<i>Calotis scapigera</i>		R
	Spiny Lignum	<i>Muehlenbeckia horrida</i> ssp. <i>horrida</i>		R
	Creeping Boobiella	<i>Myoporum parvifolium</i>		R
Regionally Threatened Communities within the South Australia Murray-Darling Basin				
River corridor woodlands, <i>Eucalyptus camaldulensis</i> and <i>E. largiflorens</i> woodlands – no priority category but listed by Kahrmanis et al. (2001) as threatened.				
Lignum <i>Muehlenbeckia florulenta</i> Shrubland – no priority category but listed by Kahrmanis et al. (2001) as threatened.				
Common Reed <i>Phragmites australis</i> /Narrow-leaf Bulrush <i>Typha domingensis</i> Sedgeland – no priority category, but listed as threatened by Kahrmanis et al. (2001).				
<i>Eucalyptus cyanophylla</i> Open mallee (open scrub) with sparse sclerophyllous shrubs – priority 3 – poorly conserved				