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).

Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.

2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 14, 3rd edition). A 4th edition of the Handbook is in preparation and will be available in 2009.

3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

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

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DD MM YY

Designation date | Site Reference Number

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2. Date this sheet was completed/updated:

April 2011

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3. Country:

Australia

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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.

Macquarie Marshes (including Macquarie Marshes Nature Reserve, Wilgara and U-block)

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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** ❑

When the Macquarie Marshes Ramsar site was first listed in August 1986, it consisted of the Macquarie Marshes Nature Reserve, including U-block. In February 1995, under the National Parks (Special Provisions) Bill, U-block was exchanged for Hall's Block (Lot 10 and Lot 8), which was then added to the Nature Reserve (see Map 1).

In January 1998, when the Ramsar Information Sheet (RIS) was updated, the boundary was amended to align with the new boundary of the Nature Reserve, removing U-block. It is acknowledged that U-block should still be part of the Ramsar site and the RIS is being updated in accordance with Resolution VIII. 21 Clause 9A of the Convention – *the site boundary has been drawn incorrectly and there has been a genuine error*. The area of U-block being re-instated in the Ramsar site is 189 ha, which does not include the road reserve passing through it.

In 2011, an area known as Creswell, which was gazetted as Nature Reserve on 13 January 2006, is being added to the Ramsar site. Creswell is contiguous with the northern boundary of the Nature Reserve and includes Lot 1, DP403974, Lot 4, DP751575, Lot 2, DP751622 and Lot 1, DP751622. This addition increases the area of the Ramsar site by 688.17 ha.

** **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:
Changes to the wetlands types listed in the 2000 RIS have been made, as better information is now available after extensive vegetation mapping was carried out in 2008. Wetland types P and Tp were removed because they were erroneously included in the 2000 RIS for the Macquarie Marshes Ramsar site.

The Macquarie Marshes RIS was last updated in January 2000. Since then there has been a significant drought and continued water extractions. As a result there have been changes to the inundation regime, wetland vegetation and waterbird breeding at the site.

Changes to flow regime:

- There has been a significant reduction in area inundated and frequency of floods in the Marshes (Thomas et al. 2011).

Changes to wetland vegetation:

- A survey of the condition of river red gum forest and woodland in 2008 found a decline in both over-storey condition (tree health) and understorey composition (species richness and type) since 1991 (Bowen and Simpson 2010). Responses to flooding in 2010/2011 have not been measured as yet, but were positive.
- In the Ramsar site between 1991 and 2008, there was a 60% reduction in the area of semi-permanent wetland vegetation - common reed, cumbungi and water couch marsh (Bowen and Simpson 2009). Common reed has reduced in area by 47% (3,354 ha mapped in 1991 to 1,774 ha in 2008), cumbungi by 100% (278 ha in 1991 to 0 ha in 2008) and water couch marsh by 83% (1,297 ha in 1991 to 218 ha in 2008). Responses to flooding in 2010/2011 have not been measured as yet, but were positive.

Changes to waterbird breeding:

- Colonial nesting waterbirds have been recorded breeding in seven locations in the Macquarie Marshes Ramsar site since listing in 1986. In the most recent large scale breeding events in 2000 and 2010/2011, two of these locations were not used, Hunt's Woodland, a river red gum breeding site that has not been used since 1993 and Louden's Lagoon, a common reed and marsh club-rush site that has not been used since 1998. The vegetation in Hunt's woodland was stressed, with approximately 30% of trees dead, and the vegetation in Louden's Lagoon was in poor condition, probably due to lack of water, reed bed fires in 2001, 2004, 2007/08 and 2009 and the impact of high densities of pigs, goats and kangaroos (DNR 2007; DECCW 2011).

Changes to Ramsar criteria:

- In 2011, there is evidence that the Ramsar site meets Criterion 8.

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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): ☑; Map of Macquarie Marshes Ramsar site at Map 1

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 Macquarie Marshes Ramsar site includes part of the Macquarie Marshes Nature Reserve, part of the privately owned property Wilgara and the privately owned U-block.
The boundary for the Nature Reserve component of the Ramsar site is the Reserve boundary as gazetted on 13/1/2006, excluding Ninia (Lots 1 and 4, DP753493).

The boundary for the Wilgara component of the Ramsar site generally follows the cadastral boundary of Lot 1, DP 753498 except for the eastern boundary which is defined by a fence extending from its intersection with the northern boundary of Lot 1 at 147°45'2.55"E and 30°55'21".6 S to its intersection with the southern boundary of Lot 1 at 147°45'11.04" E and 30°56'47.7".

The boundary of the U-block component of the Ramsar site is the cadastral boundary of Lot 47, DP 727216. The boundary excludes the road reserve (Warren-Carinda road) that runs south to north through the western part of the block.

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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.

Macquarie Marshes Nature Reserve and U-block section of the Ramsar site: Latitude 30° 45'S Longitude 147° 33'E

Wilgara section of the Ramsar site; Latitude: 30° 56'S Longitude: 147° 45'E

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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.

The Macquarie Marshes Ramsar site is in central western New South Wales, south-eastern Australia. The Macquarie Marshes Nature Reserve and U-block are about 100 km north of the town of Warren and 30km west of the town of Quambone. The Wilgara wetland is 20 km east-southeast of the Macquarie Marshes Nature Reserve.

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10. Elevation: (in metres: average and/or maximum & minimum)
135-145 metres above mean sea level

11. Area: (in hectares)
Macquarie Marshes Nature Reserve (excluding Ninia) – 19,078 ha
Wilgara wetland - 583 ha
U-block – 189 ha
Total area – 19,850 ha

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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 Macquarie Marshes cover an area of approximately 200,000 ha and are one of the largest freshwater wetlands in the Murray-Darling Basin. The ecological system contains a variety of wetland types, ranging from frequently inundated, semi-permanent wetlands to ephemeral wetlands inundated by only the largest floods.

The Macquarie Marshes Ramsar site covers approximately ten per cent of the greater Macquarie Marshes. The Ramsar site contains core areas of semi-permanent wetlands, including forests and woodlands, reed beds, marshes, rushlands and open water lagoons. The Macquarie Marshes are one of the Murray-Darling Basin's most biologically diverse wetland systems supporting some of the largest waterbird breeding events in Australia's recorded history.

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 greater Macquarie Marshes are one of the largest freshwater wetlands in the Murray-Darling Basin biogeographic region. They are a representative example of an inland floodplain wetland relying on water from a higher rainfall upper catchment and having extensive and changeable wetlands in their semi-arid lowland reaches. They are unique in terms of their size and their diversity of wetland types (Mussared 1997), and the extent of particular wetland communities. It is estimated that the Murray-Darling Basin has over 30,000 wetlands, but the greater Macquarie Marshes is one of only four wetlands covering 200,000 hectares or more (Crabb 1997).

The wetland communities in the Ramsar site comprise a mosaic of common reed reed beds, water couch marsh and mixed marsh, lignum shrublands, river red gum forests and woodlands, coolibah woodlands and open water lagoons. The river red gum forest and woodlands, common reed reed beds and water couch marsh are rare examples of these wetland types in the Murray-Darling Basin. These communities support significant wetland species diversity including colonial nesting waterbirds, migratory shorebirds, frogs, fish and reptiles (Marchant and Higgins 1990; Mussared 1997; Kingsford and Johnson 1998; Kingsford and Auld 2005).

Criterion 2. A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

Species information set out in table below

The Macquarie Marshes Ramsar site supports 35 threatened species (Appendix 1). Seven species are internationally listed as critically endangered, endangered or vulnerable (IUCN Red List 2008). Of these, the five listed in the table below are wetland dependent:

Common name	Scientific name	IUCN	CITES	CMS	National Status
Fish					
Silver perch	*Bidyanus*	VU	-	-	Vulnerable

	bidyanus				(FM Act,1994 - NSW)
Murray cod	*Maccullochella peelii peelii*	CR	-	-	Vulnerable (EPBC Act 1999)
Birds					
Australasian bittern	*Botaurus poiciloptilus*	EN	-	-	Endangered (EPBC Act 1999)
Superb parrot	*Polytelis swainsonii*	VU	II	-	Vulnerable (EPBC Act 1999)
Australian painted snipe	*Rostratula australis*	EN	-	-	Vulnerable (EPBC Act, 1999)

The Ramsar site also supports the nationally endangered Coolibah - blackbox woodland of the Darling Riverine Plains and Brigalow Belt South bioregions (*Environment Protection and Biodiversity Conservation Act 1999*, EPBC Act 1999) and two NSW-listed endangered ecological communities: Coolibah-black box woodland of the northern riverine plains in the Darling Riverine Plains and Brigalow Belt South bioregions (*Threatened Species Conservation Act 1995, TSC Act 1995*); and the Aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River (*FM Act 1994*).

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 Macquarie Marshes support one of only three extensive river red gum (*Eucalyptus camaldulensis)* woodlands (approx 6,000 ha) in the Murray-Darling Basin. The other two are in the southern half of the Murray-Darling Basin on the Murrumbidgee and Murray Rivers. The woodlands in the Macquarie Marshes Ramsar site provide nesting sites and habitat for both waterbirds and woodland birds. The Macquarie Marshes is also one of only two sites in the Murray-Darling Basin (the other being the Great Cumbung Swamp) supporting extensive common reed (*Phragmites australis)* reed beds. In 1991, the Macquarie Marshes Nature Reserve supported approximately 2,000 hectares of common reed in two main reed beds, one in the northern and one in the southern section of the Nature Reserve. The Macquarie Marshes is also one of only two areas (the other being the Gwydir Wetlands) with extensive water couch (*Paspalum distichum*) marsh (approx. 900 ha) in the Murray-Darling Basin. In 2011, water couch marsh is reduced in area significantly and occurs mostly outside the Nature Reserve on private land, including in the Wilgara wetland and U-block components of the Ramsar site. These wetland vegetation communities provide habitat for 77 waterbird species and 15 frog species.

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 provides highly significant habitat for colonial nesting waterbirds. It is one of the few areas supporting large breeding colonies of straw-necked ibis *(Threskiornis*

spinicollis) in Australia and one of only a few sites in NSW where magpie geese (*Anseranas semipalmata)* breed (Kingsford and Thomas 1995). It also supports some of the largest breeding colonies of intermediate egret *(Ardea intermedia),* rufous night heron *(Nycticorax caledonicus)* and royal spoonbill *(Platalea regia)* in southern Australia, as well as a rich diversity of other waterbirds including cormorants, herons, spoonbills and ducks, many of which breed here (DECCW 2011; DECCW 2010).

The Ramsar site provides important habitat for 17 species of migratory birds listed under the Japan-Australia, China-Australia and South Korea–Australia Migratory Bird Agreements (JAMBA, CAMBA and ROKAMBA respectively). These are the white-bellied sea-eagle (*Haliaeetus leucogaster*), cattle egret (*Ardea ibis*), great egret (*Ardea alba*), caspian tern (*Sterna caspia*), bar-tailed godwit (*Limosa lapponica*), black-tailed godwit (*Limosa limosa*), common greenshank (*Tringa nebularia*), common sandpiper (*Actitis hypoleucos*), curlew sandpiper (*Calidris ferruginea*), Latham's snipe (*Gallinago hardwickii*), marsh sandpiper (*Tringa stagnatilis*), red-necked stint (*Calidris ruficollis*), sharp-tailed sandpiper (*Calidris acuminata*), wood sandpiper (*Tringa glareola*), glossy ibis (*Plegadis falcinellus*), fork-tailed swift (*Apus pacificus*) and white-throated needletail (*Hirundapus caudacutus*).

In a catchment that has been highly modified by agricultural activities, these remaining wetlands are a regionally important refuge for wildlife including three species of turtle (*Chelodina expansa, Chelodina longicollis* and *Emydura macquarii*), 12 species of frogs including green tree frog (*Litoria caerulea*), Peron's tree frog (*Litoria peronii*) and spotted grass frog (*Limnodynastes tasmaniensis*) and waterbirds such as magpie geese (*Anseranas semipalmata*), Pacific black duck (*Anas superciliosa*) chestnut teal (*Anas castanea*) and white-faced heron (*Egretta novaehollandiae*). They represent an important drought refuge during periods when many other inland wetlands have dried out.

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

Sixteen species of colonial nesting waterbirds have been recorded breeding in the greater Macquarie Marshes, with the great egret (*Ardea alba*), intermediate egret (*Ardea intermedia*), little egret (*Ardea garzetta*), nankeen night heron (*Nycticorax caledonicus*), glossy ibis (*Plegadis falcinellus*), Australian white ibis (*Threskiornis molucca*), straw necked ibis (*Threskiornis spinicollis*), little pied cormorant (*Phalacrocorax melanoleucos*)and little black cormorant (*Phalacrocorax sulcirostris*) the most numerous (Kingsford & Thomas 1995; Kingsford & Auld 2005). Of the 15 known breeding sites for these species in the Marshes, six are in the Nature Reserve part of the Ramsar site and one is in the Wilgara part of the Ramsar site. Therefore, the Ramsar site supports nearly 50% of known colonial nesting waterbird breeding sites.

The flow regime of the Macquarie River is highly variable from year to year and as a result the frequency and duration of flooding is also highly variable. Waterbirds are adapted to this variability and large numbers come to the Macquarie Marshes when high flows cause extensive inundation. Kingsford and Auld (2003) have shown that counts of large numbers of colonial nesting waterbirds (specifically ibis, egrets, cormorants and night herons) are correlated with flows of greater than 200,000 megalitres at Oxley gauge, upstream of the Marshes.

Between 1986 and 2000, the Macquarie Marshes probably supported more than 20,000 colonial nesting waterbirds in at least two-thirds of the seasons when flows exceeded 200,000 megalitres at Oxley (1988, 1989, 1990, 1993, 1996, 1998 and 2000). Nest counts in the Ramsar site for these years were 2,600, 6,200, 37,500, 9,300, 2,700, 23,800 and 29,100. If nests are a used to estimate bird numbers (2 adults per nest plus chicks), then it is likely that 20,000 colonial nesting waterbirds were supported by the Ramsar site in at least five of these years (1989, 1990, 1993, 1998 and 2000) (Kingsford and Auld 2003).

Low inflows between 2001 and 2009 meant that adequate habitat was not available in the Marshes to support large numbers of colonial nesting waterbirds. However, in spring-summer 2010/2011, following rainfall and inflows to the Macquarie Marshes, a large breeding colony established in the South Marsh in Monkeygar Swamp, outside the Ramsar site. This colony bred twice, with straw-necked ibis occupying firstly about 30,000 nests and then about 70,000 nests. At the same time, two mixed colonies of egrets, cormorants and herons (approximately 25,000 nests at each site) successfully bred in the northern section of the Nature Reserve.

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.

Due to the location of the Macquarie Marshes at the lower end of the Macquarie catchment, its fish communities are a blend of those found in adjacent main channel habitats upstream and downstream, but also in adjacent systems such as Marthaguy Creek. During high flows, fish are likely to move into the Marshes from these areas (King 2004; Jenkins and Wolfenden 2006). The Macquarie Marshes support a significant life history stage as recent evidence suggests that native fish such as silver perch (*Bidyanus bidyanus*) and golden perch (*Macquarie ambigua*), move out of the main channel habitats into the floodplain to breed and spawn with the onset of high flows (Balcombe et al. 2007). It is also possible that these species may breed in the main channel during smaller flow events if conditions are suitable (Humphries et al. 1999).

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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

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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.

Studies of the geomorphology of the Macquarie system indicate a long history of fluvial change related to climate and hydrology, with channels and marshes being formed and abandoned over timeframes ranging from several thousands of years to less than one hundred

years. Flow regime in the Macquarie River has a long history of natural variability. In particular, intra-seasonal, interannual and interdecadal climatic fluctuations may cause significant hydrological variability. The Macquarie Marshes have existed in their current location and maintained their general wetland state for the last 6,000 to 8,000 years (Watkins and Meakin 1996; Ralph 2001; Ralph 2008; Yonge and Hesse 2009).

The Macquarie Marshes occur in an area of distributary development and extensive channel breakdown on the lower reaches of the Macquarie River (Ralph 2008). The core wetlands of the Macquarie Marshes and the Ramsar site are associated with the modern channel of the Macquarie River and its primary distributaries, while the alluvial plain consists of an arrangement of active and abandoned channels. Semi-permanent wetlands occur in regularly inundated areas on the alluvial plain, while dryland vegetation is associated with areas receiving irregular or no inundation (Ralph 2008). The modern floodplain of the Macquarie Marshes is broad and flat, reaching up to 25 km in width. The Marshes have a low longitudinal gradient of 0.0002 to 0.0004 and have a typical difference in vertical relief of less than two metres (Ralph 2008).

The modern river system is dominated by silt and clay-sized sediments that are accreting over alluvial materials deposited on the Macquarie Alluvial Plain by the late Quaternary. Between two and nine metres of silts and clays have been deposited during the Holocene and mostly overlie the sandy clay palaeochannel sediments in the central parts of the Macquarie Marshes. Low alluvial ridges and shallow depressions on the alluvial plain are also indicative of palaeochannels and tend to border the western and eastern sides of the modern marsh area. In addition, some palaeochannels have been reoccupied through the capture of floodwaters and/or the diversion of younger channels into their paths (Ralph 2008).

The South Marsh, of which the southern section of the Macquarie Marshes Ramsar site is a part, is characterised by low-sinuosity distributary channels and marsh channels, extensive unchannelised plains and a few small areas of active reed beds (Ralph 2008). In contrast, the North Marsh is characterised by larger reed beds that receive water from a few main streams with many interconnected floodplain-surface channels (Ralph 2008).
Throughout the Macquarie Marshes, there are many fine scale geomorphological features including small channels, low levees, flood basins, depressions, shallow scour-lines and gilgai. These features affect the distribution of floodwaters across the floodplain, particularly small to moderate magnitude floods, and in turn affect channel and floodplain sedimentation and erosion (Ralph 2008). Floodwaters may reconverge through small channels at the downstream limits of wetlands, or the channels may repeatedly branch and break down into reed beds.

17. Physical features of the catchment area:

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

Geologically, the upper Macquarie catchment is mainly composed of north-south aligned palaeozoic volcanic and sedimentary rocks of the Lachlan fold belt and north-west dipping mesozoic sediments of the Great Australian Basin (DEC 2000). Neogene and quaternary

sediments have filled the alluvial valley in the middle catchment and the lowland riverine plain (Watkins and Meakin 1996).

The Macquarie alluvial plain, which includes the lower Macquarie River and Macquarie Marshes, is located in the southern portion of the Upper Darling Riverine Plain and is one of the low-gradient alluvial floodplains in the region that converge on the Barwon-Darling River. The majority of the surface of the plain is covered by cainozoic alluvium with depths of up to 100 metres and includes several small inliers of palaeozoic rocks which are exposed as crests of buried hills (Ralph 2008; Watkins and Meakin 1996).

Despite substantial local rainfall in some years, the supply of water to the Macquarie Marshes is more dependent on rainfall in the upper catchment than localised rainfall. A pronounced climatic gradient exists from upstream to downstream along the Macquarie catchment, from highland regions with higher rainfall and less evaporation, to lowland areas with less rainfall and higher evaporation (DECCW 2010).

The upper Macquarie catchment is sub-humid, with mean annual rainfall ranging from 600 to 1,000 mm per year and mean annual potential evapotranspiration from 1,400 to 1,600 mm (BoM 2006). The lower Macquarie catchment in the region of the Macquarie Marshes receives an average of 400 to 500 mm rainfall per year and mean potential evapotranspiration is 2,000 to 2,400 mm per year.

There are two major dams in the upper Macquarie catchment. Burrendong Dam is situated on the Macquarie river, just below its junction with the Cudgegong River, 30 km upstream of Wellington in central west NSW. It was completed in 1967 and has a capacity of 1,188,000 megalitres. The main purpose of the dam is to capture rainfall runoff and river flows in the upper catchment to supply irrigation, stock and household needs in the Macquarie valley. It also regulates environmental flows to the Macquarie Marshes (State Water Corporation 2009a). Windamere Dam was completed in 1984 and is upstream of Burrendong Dam on the Cudgegong River. It has a storage capacity of 368,120 megalitres and is operated in conjunction with Burrendong Dam to supply water to the Cudgegong and Macquarie valleys (State Water Corporation 2009b).

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18. Hydrological values:

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

The Macquarie Marshes regulate hydrological processes and cycles, including retaining and retarding flows, maintaining groundwater-surface water balances through recharge/ discharge processes. The Marshes provide a critical service in the uptake, transformation, processing, storage, movement and re-uptake of compounds that promote biological growth or development, including repeated pathways of particular nutrients or elements from the environment through one or more organisms back to the environment. This includes primary production and the carbon, nitrogen and phosphorus cycles.

The Marshes provide trapping and stabilisation of sediment and accumulation of organic matter that allows the formation of fertile self mulching clays in the Marshes. They slow water flow, trapping and assimilating sediments, nutrients and other contaminants, and "buffering" the amount of contaminant transfer that may occur during flow events. Diffuse sources of pollution include stormwater runoff from urban or agricultural land, irrigation

areas and degraded landscapes. Point sources include discharges from sewage treatment plants and industry.

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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 • <u>N</u> • O • P • Q • R • Sp • Ss • Tp <u>Ts</u> • U • Va • Vt • <u>W</u> • <u>Xf</u> • 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.

Xf, Ts, W, N

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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 Macquarie Marshes are one of the largest freshwater wetlands in the Murray-Darling Basin. The ecological system contains a variety of wetland types, ranging from semi-permanent and frequently inundated marshes to ephemeral wetlands inundated by only the largest floods (Benson 2006). Core areas of semi-permanent wetlands occur in the Macquarie Marshes Ramsar site including river red gum forests and woodlands, common reed beds, water couch marshes, cumbungi rushlands and open water lagoons which are fed by overbank and overland flooding from many small channels (Bacon 2004; DECCW 2010).

The Marshes support some of the largest waterbird breeding events in Australia's recorded history. They provide essential breeding and feeding habitat for hundreds of species of animals and plants (Jenkins 2006). Of particular value is their role in absorbing, recycling and releasing nutrients. This provides conditions suitable for some of the highest densities of microinvertebrates reported in wetlands anywhere in the world. These microinvertebrates are an important component of the Marshes food web (Jenkins and Wolfenden 2006).

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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*.

324 plant species have been recorded in the Macquarie Marshes Ramsar site with one species, aromatic peppercress (*Lepidium hyssopifolium*) being listed as endangered under the NSW *Threatened Species Conservation Act 1995* and listed as endangered nationally under the *Environment Protection and Biodiversity Conservation Act 1999*.

Invasive species that occur within the Macquarie Marshes include lippia (*Lippia canescens)*, noogoora burr (*Xanthium occidentale*) and horehound (*Marrubium vulgare*). The invasion of exotic species is changing some vegetation complexes. There is a moderate infestation of *Lippia*, with high levels of infestation along some waterways, especially along the North

Marsh bypass channel. It is particularly a threat to water couch areas, as its prostrate growth form can completely cover the ground (Brock 1998).

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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.*

233 bird species have been recorded in the Macquarie Marshes Ramsar site, including 77 waterbird species, 19 birds of prey, six night birds, 17 parrots, five pigeons and 109 bush or land birds. Twenty-five of these are listed as either endangered or vulnerable in NSW under the *Threatened Species Conservation Act 1995* and two species, the superb parrot (*Polytelis swainsonii*) and the Australian painted snipe (*Rostratula australis*) are nationally listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*. Seventeen species are listed on JAMBA, CAMBA and ROKAMBA. These species are listed under criterion 4 in section 14 of this RIS.

Many once common woodland birds are now considered to be declining in south-eastern Australia. Reid (1999) listed 20 woodland bird species whose numbers have declined significantly since the 1980's. Eighteen of these are found commonly in the Macquarie Marshes Nature Reserve.

There is one fish species, silver perch (*Bidyanus bidyanus*) listed as vulnerable under the NSW *Fisheries Management Act* 1994. Silver perch was recorded in 2008 in the Marshes in a formal survey for the first time since 1989 (DPI 2005). There is also one record from 1975 of the Murray cod (*Maccullochella peelii peelii*), which is nationally-listed as a vulnerable species.

In the Macquarie Marshes, densities of microinvertebrates in recently inundated floodplain habitats are amongst the highest recorded in the world. Epibenthic habitats (close to wetland bottom) in temporary floodplain and creeks contain a high density of microinvertebrates available as potential prey to macroinvertebrates and fish. The four main types of microinvertebrates found in the floodplain and temporary channels in the Macquarie Marshes are rotifers, cladocerans, ostracods and copepods (Jenkins and Wolfenden 2006).

Invasive species that occur within the Macquarie Marshes include foxes, pigs, cats and European carp. Feral pigs are common on the lower floodplain and among the reed beds. They prey on eggs and young of ground-nesting birds and disturb marsh soil and vegetation. Foxes and feral cats also affect native fauna (Brock 1998). European carp cause erosion in the Marshes, damaging aquatic vegetation and re-suspending nutrients such as phosphorus (Brock 1998) and compete with native fish.

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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:

Until 1990, Macquarie Marshes Nature Reserve was divided into leased blocks that were used for cattle grazing. Although the Nature Reserve is no longer used for primary production it is important to acknowledge this history. Cattle production continues to be important in the

Wilgara and U-block components of the Ramsar site and for other landholders that neighbour the Ramsar site.

The Macquarie Marshes are an iconic natural area with significant cultural values. Many people have significant links with the Marshes through historic connections, land and water management roles, living and/or working in the vicinity or involvement with an environmental or primary production group.

Aboriginal cultural values relate to the deep history of Aboriginal interaction with the wetlands and the values, interests and aspirations of contemporary Aboriginal communities with custodial relationships to the wetlands. Aboriginal cultural values relate to specific places, specific plants and animals, and also the wetlands landscape as a whole (DECCW 2010).

Within a semi-arid landscape, the Macquarie Marshes provides iconic natural scenery and aesthetic amenity. Its wetlands are attractive landscapes that locals and visitors view, enjoy, or otherwise appreciate. During floods, visitors can view the birds from a hide on one of the public roads.

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:

Indigenous cultural sites have been identified in the Macquarie Marshes Ramsar site. These include 6 scarred trees, 58 hearth, 15 artefact and 5 earth mound sites. Hearth sites are generally grouped together indicating that groups of about 30 people may have travelled through this landscape or met in the locations, assuming that an estimated 4-6 people shared each hearth. Such a concentration of sites indicates that large numbers of people would have gathered around the Marshes when resources were abundant (Peckham & Molsher 2006). The Whalan collection of photographs shows Aboriginal communities in the Marshes and some of their traditional ceremonies (Kingsford 2000).

Earth mounds found in the Marshes are pre-European heaps of raised dirt generally consisting of charcoal rich sediment with fragments of burnt clay (Balme & Beck 1996). The function, construction and role of these earth mounds are not well understood. People may

have used these mounds as campsites from which to harvest fish, mussels, waterbirds and aquatic plants when the water was high or they may have served as hut foundations, burial places or gardens. Mounds in the Macquarie Marshes (and to the north at Narran Lake) have extremely high archaeological significance at a local, regional and national level because they are the only examples of this type of mound that have been located outside the Murray Valley (NPWS 1993). These mounds, along with those at the Narran Lake, represent the most northerly location of Aboriginal earth mounds in Australia (Peckham & Molsher 2006).

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24. Land tenure/ownership:

a) within the Ramsar site:

The Macquarie Marshes Nature Reserve (96 % of site) was previously Crown land reserved for the Preservation of Game in 1900. It was gazetted as a Nature Reserve in 1971 and is managed by the Office of Environment and Heritage under the *National Parks and Wildlife Act 1974*.

U-block (1 % of site) is on freehold land owned and managed by the Hall family. The Wilgara wetland (3 % of site) is on freehold land owned and managed by the Coleman family.

b) in the surrounding area:

The surrounding lands are mostly freehold land.

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25. Current land (including water) use:

a) within the Ramsar site:

The land in the Macquarie Marshes Nature Reserve is managed for nature conservation and there is limited public access (Benson 2006). The Wilgara wetland and U-block are used for grazing beef cattle and managed for conservation through the application of sustainable grazing management practices (Biosis Research 2006). Scientific research within the Macquarie Marshes is focussed on measuring the benefits of environmental water management and pest control. There is also ongoing investigation of ecosystem functions and geomorphological structure and how alterations to structure and functions will impact on the resilience of the wetlands.

b) in the surroundings/catchment:

A range of agricultural industries are undertaken on surrounding private lands. Beef cattle are grazed in the more frequently flooded areas and sheep (wool and meat) on surrounding drier land. Some dryland farming (wheat, oats, sorghum and barley) and irrigated cropping (cotton), along with introduced pasture establishment, also occur in the larger Marshes area.

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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:

The threats to the Ramsar site cannot be separated from the threats to the entire Macquarie Marshes particularly with regard to water availability and water management.

b) in the surrounding area:

Threats to the site's ecological character identified in the draft *Ecological Character Description of the Macquarie Marshes Nature Reserve Ramsar site* (ECD) are listed in the table below. The ECD provides further context and information on these threats. Questions 27 and 28 below provide information on conservation measures, both existing and proposed, to address these threats.

Actual or likely threat	**Potential impact on ecological character**	**Likelihood**	**Timing of threat**
Current water management	Insufficient flow size, insufficient flow frequency, insufficient flow duration and change to flow timing leading to loss and declining health of wetland vegetation, waterbird habitat, aquatic ecological community and waterbird breeding sites (DECCW 2011; Roberts and Marston 2000: Rogers et al. 2009)	Certain/high	Immediate to medium term
Water management structures	Water diversion leading to loss and declining health of wetland vegetation, waterbird habitat, aquatic ecological community and waterbird breeding sites (Jenkins 2006: Rogers et al. 2009)	Certain/high	Immediate to medium term
Increased salinity	Impact on aquatic organisms reducing diversity and possibly abundance (Brereton et al. 2000: Jenkins et al. 2007)	Medium	Long term
Fire management	Declining health of wetland vegetation in particular common reed and river red gum woodlands (Brookhouse 1999)	Medium	Long term
Pest (feral animal and weed) management	Declining health of wetland vegetation, lower breeding success of waterbirds and declining water quality (Johnson 2005; Kingsford 2000)	Certain	Short to long term
Impacts of climate change	Reduced water availability leading to loss and declining health of wetland vegetation, waterbird habitat, aquatic ecological community and waterbird breeding sites (CSIRO 2008)	Medium	Long term
Lack of understanding of complex systems	Largely unknown but potential impact on management of waterbird breeding	Medium	Long term

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 Macquarie Mashes Nature Reserve (gazetted 1971, 19,078 ha) section of the Ramsar site is listed by the National Trust of Australia (NSW) as a Landscape Conservation Area, on the Australian Heritage Commission's Register of the National Estate and in the Directory of Important Wetlands in Australia (Environment Australia 2001). The entire site is also subject to regional, state and national policies and legislation and the JAMBA, CAMBA and ROKAMBA bilateral migratory bird agreements.

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 1993, the NSW Government adopted a Plan of Management (PoM) for the Nature Reserve component of the Macquarie Marshes Ramsar site. This plan addresses the numerous conservation and management issues required to preserve and rehabilitate the area such as water allocations, native flora and fauna, introduced species, fire, Aboriginal and European cultural heritage, as well as public access. Emphasis is placed on the water requirements of the Marshes as the key to maintaining the diversity and productivity of its wetland habitats and those of the Nature Reserve. The PoM also acknowledges that broader environmental planning mechanisms and community participation are essential to ensure effective, long-term management of the Reserve. The plan is currently being updated.

The Wilgara wetland management plan 2001 was revised in 2006 to incorporate new knowledge compiled during the development of a site ecological character description. It documents current management and actions based on the principles for management and co-operation necessary to sustainably manage the site (Webb and Fisher 2001). A wetland management plan that integrates primary production management and wetland management was prepared for the whole Wilgara property including the Ramsar listed portion in 2009 and is currently being implemented.

There is currently no management plan for the U-block component of the Ramsar site, however one is being prepared (A. Curtin pers. comm. March 2011).

d) Describe any other current management practices:

In December 2000, the NSW parliament passed the *Water Management Act 2000* which allowed the preparation of water sharing plans. On 1 July 2004, the new access licensing and approvals system commenced for areas covered by 31 water sharing plans, which included the *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2003* (Macquarie-Cudgegong WSP).

Under the Macquarie-Cudgegong WSP, the previous environmental allowance of 125,000 megalitres of mixed high security and general security allocation was converted to a 160,000 megalitres Environmental Contingency Allowance (ECA) with general security characteristics (NSW Government 2003).

The Commonwealth, State and Territory governments of Australia have recognised the urgent need to increase the productivity and efficiency of Australia's water use and services to rural and urban communities while ensuring the on-going health of Australia's rivers, wetlands and groundwater systems. In 2004, this recognition led to the Intergovernmental Agreement on a National Water Initiative, a commitment to water reform that has been signed by all Australian governments.

The NSW government has acknowledged that the decline of rivers and wetlands in NSW must be halted. The NSW Wetland Recovery Plan, a $26.8 million program jointly funded by the NSW and Australian governments and the NSW Rivers Environmental Restoration Program (RERP), another jointly funded program totalling $173.27 million, aim to restore the ecological systems in many wetlands, including the Macquarie Marshes.

At the end of January 2011, RERP had purchased 42,263 megalitres of general security and 140 megalitres of supplementary access entitlements for the Macquarie Marshes. Combined with purchases under other State and Australian Government programs, the environment's share of available water has increased by over 60% above the ECA provided by the Macquarie–Cudgegong WSP. This significantly improves the ability of government to supply environmental water to core wetland assets.

The Macquarie Marshes Adaptive Environmental Management Plan was completed in 2010. It identifies key ecological assets for the entire Macquarie Marshes and their water requirements (DECCW 2010).

Wilgara property management

The Wilgara wetland is on the Gum Cowal-Terrigal Creek system and its water inflow is subject to the Macquarie-Cudgegong WSP. A Ramsar Memorandum of Understanding (MoU) has been signed between the landowner, governments and conservation groups expressing their intention to manage the site in accordance with the Ramsar 'wise use' guidelines (Webb and Fisher 2001). A wetland management plan for Wilgara (Industry & Investment NSW 2009) identifies land types and capability, soil resources, hydrology and threats, and is being implemented by the owners to improve stock management.

Pest management

The Macquarie Marshes Ramsar site benefits from the NSW Northern Plains Region Pest Management Strategy 2008-2011 (DECC 2007). Various control programs exist for introduced plant and animal species in the Nature Reserve and Wilgara. Feral pig numbers are reduced via regular aerial shooting and foxes are controlled through co-operative baiting programs. A major focus of the program is reducing the impact of foxes and feral pigs on ground nesting birds in wetlands (DECC 2007).

Weed control in the Marshes involves manual removal and spraying with herbicides, when and where appropriate. Biological control has been introduced for Noogoora burr (*Xanthium occidentale*) and horehound (*Marrubium vulgare*) (NPWS 1993). *Lippia* occurs in the Macquarie Marshes but is yet to be identified as a major invasive species. The current strategies for controlling scheduled weeds involve collaboration between government agencies, the Central West Catchment Management Authority, local government and landholders.

Fire management

A Fire Management Plan was prepared for the Macquarie Marshes Nature Reserve for 2000-2004 (NPWS 1999). This plan still applies. A plan was prepared for the Creswell component of the reserve in 2009-2010, after its addition to the nature reserve. The plans outline fire management strategies, resourcing issues and co-operative arrangements with neighbouring properties (Brookhouse 1999; NPWS 2009).

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

The Macquarie Marshes Adaptive Environmental Management Plan (DECCW 2010) lists actions necessary to restore resilience in the greater Marshes wetland ecosystem. Some projects and actions are already underway, including: (1) modifying weirs and other barriers to improve conditions for native fish; (2) improving irrigation efficiency and purchasing water from willing sellers to return water to the environment; (3) implementing guidelines for grazing management to ensure the best outcomes from environmental water management; and (4) establishing processes for ensuring that community members participate effectively in river and wetland management.

The Murray-Darling Basin Authority is currently developing a Basin Plan, required under the *Water Act 2007*, that will establish new sustainable diversion limits for water use across the Basin, including the Macquarie Valley.

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

The variety of habitats and associated fauna, particularly waterbirds, have made the Macquarie Marshes a focus for scientific research. However, access is often difficult and support facilities are limited. The acquisition of the property Creswell on the boundary of the Nature Reserve has provided accommodation for research and management staff. Specific research projects on some aspects of wetland ecology are being carried out by the Office of Environment and Heritage, other government agencies and the University of NSW. The various areas of research are summarised in the table below.

Ecological component or process	**Description of research or monitoring**
Floodplain vegetation	Vegetation extent mapped in 1991 and remapped in 2008
River red gum	Health of some river red gums monitored at different stages
Coolibah and blackbox	Extent mapped but little ecological information
Water couch	Extent mapped but little ecological information
Common reed	Extent mapped but little ecological information
Invertebrates	AusRivas surveys in parts of the Marshes to identify communities of invertebrates; detailed analysis of invertebrate communities (diversity and abundance) in relation to habitats and flooding regimes
Invertebrate food webs	Detailed analysis of invertebrate communities (diversity and abundance) in relation to habitats and flooding regimes
Native fish species	Sporadic surveys with different methodologies
Frogs	Species list – no monitoring. Research project underway.
Reptiles	Species list – some previous but no current monitoring
Mammals	Species list – annual aerial survey of kangaroo populations
Waterbird diversity, abundance and breeding	Data are collected in October of each year in the northern third of the Macquarie Marshes on up to 50 different taxa
Colonial breeding waterbirds	Data are collected every year for the main breeding colonies in the Macquarie Marshes for 16 colonies. Data include species present and abundance of each species of waterbird. Clutch size data and reproductive success has been measured in some years

Inundation patterns and wetland area	Reasonably well known with good data on patterns of inundation currently being analysed
Geomorphology	Some analysis of alterations to the system but not well compiled. Digital elevation model currently being developed for part of the Marshes.
Water quality	Some data available but scattered and not analysed (includes pH, salinity, turbidity, nutrients, dissolved organic carbon)
Hydrological regime	Reasonably well known with good data on flows (magnitude and frequency)

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.

The Macquarie Marshes and, in particular, the Nature Reserve are utilised for educational visits by schools and universities. Open days are held, weather permitting, at the Nature Reserve in October each year during which guided walks and talks are provided by staff. The construction of a bird hide near one of the main access roads has provided a focal point for tours and bird watchers.

31. Current recreation and tourism:

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

The outstanding natural heritage values of the Macquarie Marshes Ramsar site together with its size and variety make it a potentially significant focus for tourism and recreation. However, the Wilgara wetland and U-block are on private property which is not accessible to the public and visitation at the Nature Reserve is closely managed due to the sensitivity of the environment. The inaccessible nature of the site, as well as the restricted road access, difficult terrain and lack of facilities have restricted visitation to educational groups and special interest tours.

While the Nature Reserve does not include recreation as an objective in its Plan of Management, public use is permitted as long as it does not interfere with waterbird breeding or damage habitat. Tourism NSW, the (then) Department of Environment, Climate Change and Water and the Macquarie Marshes Catchment Committee commissioned a feasibility study into the tourism potential of the Macquarie Marshes which found that tourism development opportunities are highly limited for the above-mentioned reasons (McFeeters 1999). Discovery tours are run by the Nature Reserve managers under suitable conditions.

32. Jurisdiction:

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

Property Name: Macquarie Marshes Nature Reserve, Wilgara and U-block
County: Gregory **Parish**: Weenculling
Territorial Jurisdiction: Commonwealth of Australia, State of New South Wales, Shires of Coonamble, Walgett and Warren
Functional Jurisdiction: NSW Office of Environment and Heritage

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.

Macquarie Marshes Nature Reserve
Parks and Wildlife Group, Western Directorate

PO Box 1020
Dubbo NSW 2830
Australia
Phone: 02 68410900
Fax: 02 68816326
www.environment.nsw.gov.au

Wilgara
Macquarie Marshes Ramsar Management Group (as outlined in the Memorandum of Understanding) convened by:
Wilgara
Quambone NSW 2831

U-block
The Mole
Quambone NSW 2831

NSW Government
Office of Environment and Heritage
PO Box A290
Sydney South NSW 1323
Australia
Phone: 02 99955000
Fax: 02 99955999
www.environment.nsw.gov.au

Australian Government
Department of Sustainability, Environment, Water, Population and Communities
GPO Box 787
Canberra ACT 2601
Australia
Phone: 02 62741111
www.environment.gov.au

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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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Appendix 1. Threatened flora and fauna species in the Macquarie Marshes Ramsar Site (CE = Critically endangered, E = Endangered, V = Vulnerable, NT = Near-threatened, LC = Least concern)

Common Name	**Scientific Name**	IUCN Red List 2008	EPBC Act 1999 (Cth)	TSC Act 1995 (NSW)	FM Act 1994 (NSW)
Stripe-faced dunnart	*Sminthopsis macroura*	LC		V	
Squirrel glider	*Petaurus norfolcensis*	LC		V	
Yellow-bellied sheathtail bat	*Saccolaimus flaviventris*	LC		V	
Eastern freetail bat	*Mormopterus norfolkensis*	V		V	
Little pied bat	*Chalinolobus picatus*	NT		V	
Osprey	*Pandion haliaetus*	LC		V	
Square-tailed kite	*Lophoictinia isura*	LC		V	
Black-breasted buzzard	*Hamirostra melanosternon*	LC		V	
Australian bustard	*Ardeotis australis*	NT		E	
Australasian bittern	*Botaurus poiciloptilus*	E		V	

Black-necked stork	*Ephippiorhynchus asiaticus*	NT		E	
Magpie goose	*Anseranas semipalmata*	LC		V	
Freckled duck	*Stictonetta naevosa*	LC		V	
Cotton pygmy goose	*Nettapus coromandelianus*	LC		E	
Blue-billed duck	*Oxyura australis*	NT		V	
Brolga	*Grus rubicundus*	LC		V	
Bush stone-curlew	*Burhinus grallarius*	NT		E	
Australian painted snipe	*Rostratula australis*	E	V	V	
Black-tailed godwit	*Limosa limosa*	NT		V	
Red-backed button-quail	*Turnix maculosa*	LC		V	
Major Mitchell's cockatoo	*Cacatua leadbeateri*	LC		V	
Red-tailed black-cockatoo	*Calyptorhynchus banksii*	LC		V	
Glossy black-cockatoo	*Calyptorhynchus lathami*	LC		V	
Turquoise parrot	*Neophema pulchella*	LC		V	
Superb parrot	*Polytelis swainsonii*	V	V	V	
Barking owl	*Ninox connivens*	LC		V	
Hooded robin	*Melanodryas cucullata*	LC		V	
Grey-crowned babbler	*Pomatostomus temporalis*	LC		V	
Brown treecreeper	*Climacteris picumnus*	LC		V	
Painted honeyeater	*Grantiella picta*	V		V	
Black-chinned honeyeater	*Melithreptus gularis gularis*	LC		V	
Diamond firetail	*Stagonopleura guttata*	NT		V	
Silver perch	*Bidyanus bidyanus*	V			V
Murray cod	*Maccullochella peelii*	CE	V		
Aromatic peppercress	*Lepidium hyssopifolia*		E	E	

(IUCN 2012; DECCW 2011; DPI 2005; Marchant and Higgins 1990; Atlas of NSW Wildlife; Reid 1999)

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