South Australian
HERITAGE COUNCIL

BETTER HERITAGE INFORMATION
SUMMARY OF STATE HERITAGE PLACE
Lake Callabonna Fossil Reserve

Lake Callabonna Fossil Reserve SHP 14268, c.2000.

Source: DEW Files

ENTRY IN THE REGISTER

Description or notes with respect to a place entered in the South Australian Heritage Register in accordance with either the *South Australian Heritage Act 1978* or the *Heritage Places Act 1993.*

The South Australian Heritage Council may correct errors or inaccuracies in the entry in the Register in accordance with s21 of the *Heritage Places Act 1993*.

NAME: Lake Callabonna Fossil Reserve **PLACE NO.:** 14268

ADDRESS: Adnyamathanha and Malyangapa Country
Lindon 5731
CR 5759/715 H833200 S1002
Outside of Hundreds

CONFIRMED IN THE SOUTH AUSTRALIAN HERITAGE REGISTER:

13 February 1997

DESIGNATED AS A PLACE OF PALAEONTOLOGICAL SIGNIFICANCE:

10 October 1996

S16 CRITERIA SATISFIED UNDER *HERTIAGE PLACES ACT 1993*

(c) it may yield information that will contribute to an understanding of the State's history, including its natural history

COMMENTARY ON THE LISTING

Additional information provided as a part of the content of the South Australian Heritage Register in accordance with s14(6) of the *Heritage Places Act* 1993 'hold information in association with the Register'.

KNOWN AS: Lake Callabonna Fossil Reserve, Vertebrate Fossil Site [Designated as a place of palaeontological significance]

STATEMENT OF HERITAGE SIGNIFICANCE

Lake Callabonna Fossil Reserve has potential to provide insights into the behaviour, morphology, evolution and extinction of Australia's marsupials and birds. Abundant with fossils, the site has yielded outstanding, highly intact and complete or near-complete specimens of the ancient megafauna of South Australia, including the marsupial *Diprotodon* and emu-like bird, *Genyornis*. Unusually, specimens recovered from Lake Callabonna are frequently articulated, and lime-cemented clays have facilitated the preservation of soft body parts typically not preserved, such as skin, hair, footpads, feathers and gut contents. The clay lakebed has also preserved rare *Diprotodon* trackways. The vast size of the lakebed means large areas of fossil-bearing sediment remains undisturbed. Ongoing research is highly likely to contribute to further understanding of the evolution of megafauna in South Australia.

STATEMENT OF DESIGNATION

Designated Place of Palaeontological Significance

Lake Callabonna Fossil Reserve contains abundant late Pleistocene-aged fossil fauna, particularly those of megafauna such as *Diprotodon* and *Genyornis,* that have been a focus of palaeontological research for more than a century. The site has yielded hundreds of exceptionally intact fossil specimens, many of which have been preserved as whole skeletons and some of which remain articulated. Soft body parts such as feathers, fur and hide have been preserved as well as rare *Diprotodon* trackways in the lakebed and megafauna stomach contents that may provide insight into the ancient environment at the time. Research is highly likely to provide additional information into the life history, evolution and potential extinction of megafauna in South Australia.

Elements of Significance:

Elements of heritage significance include:

- Fossiliferous sediments,
- In-situ fossils,
- Preserved trackways.

Elements not considered to contribute to significance of place include:

- Built structures, including buildings and signage.

CRITERIA (under section 16 of the Heritage Places Act 1993)

(c) it may yield information that will contribute to an understanding of the State's history, including its natural history

Lake Callabonna is highly likely to yield information that will contribute to an understanding of the behaviour, morphology, evolution and extinction of the state's ancient marsupials and birds, including its megafauna.

Fossil material found at the Lake Callabonna Fossil Reserve is highly intact, sometimes complete and abundant. Lake Callabonna has yielded rare complete or near-complete skeleton specimens of extinct species such as *Diprotodon optatum* (a large marsupial) and *Genyornis newtoni* (a large emu-like flightless bird). Unusually, specimens recovered from Lake Callabonna are frequently articulated, and lime-cemented clays have facilitated the preservation of soft body parts usually not preserved, such as skin, hair, footpads and feathers, providing insights into species morphology. The exceptionally preserved feet of many specimens demonstrates their mode of death, yielding valuable taphonomic evidence.

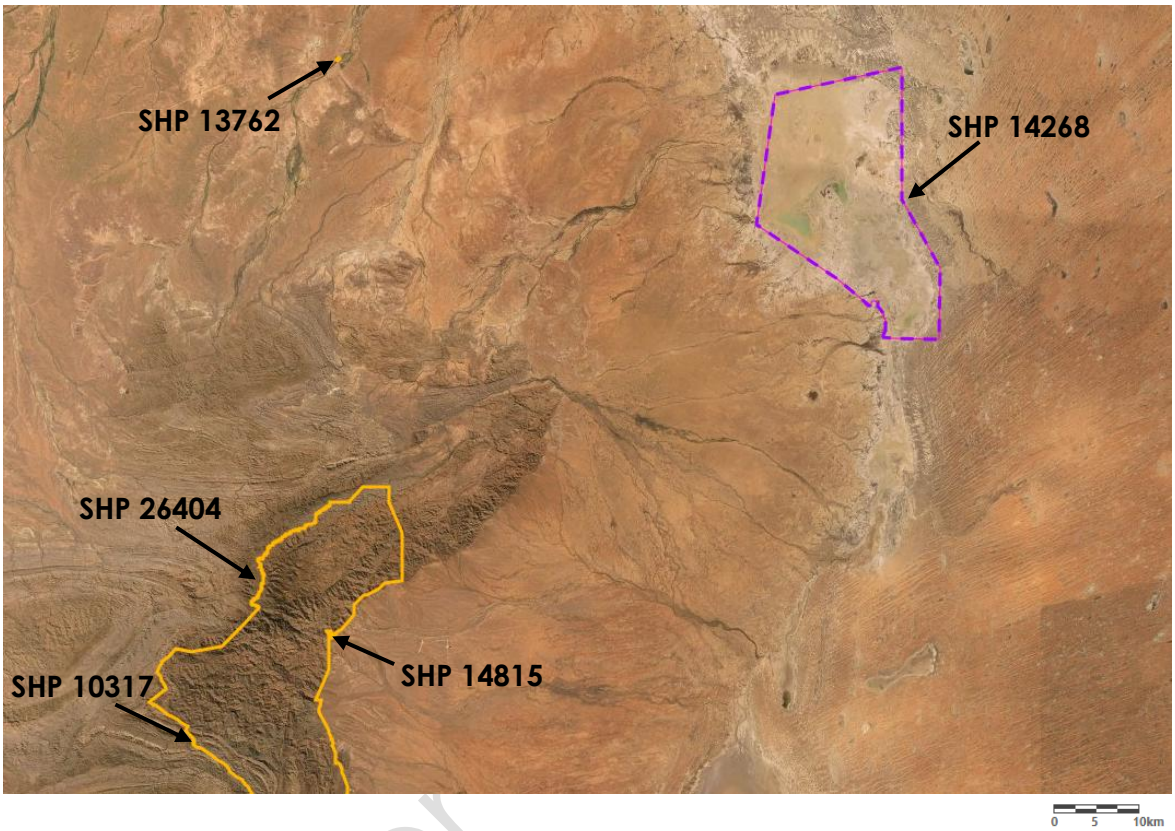
Rare animal trackways have yielded insights into the living habits of ancient animals. While fossilised gut contents provide information about not only the diet of extinct megafauna but also the surrounding environment at the time of deposition.

Since the 1890s, Lake Callabonna has consistently yielded abundant and exceptional fossil material. The vast size of the lakebed means large areas of fossil-bearing sediment remains undisturbed. Lake Callabonna is highly likely to yield further information about South Australia's natural history which is not readily available through other sources.

SITE PLAN

Lake Callabonna Fossil Reserve
Lindon SA 5731

PLACE NO.: 14268



Lake Callabonna Fossil Reserve, Adnyamathanha and Malyangapa Country, Lindon 5731, CR 5759/715 H833200 S1002 Outside of Hundreds

LEGEND **N ↑**

Parcel boundaries and Elements of Significance (Indicates extent of listing)

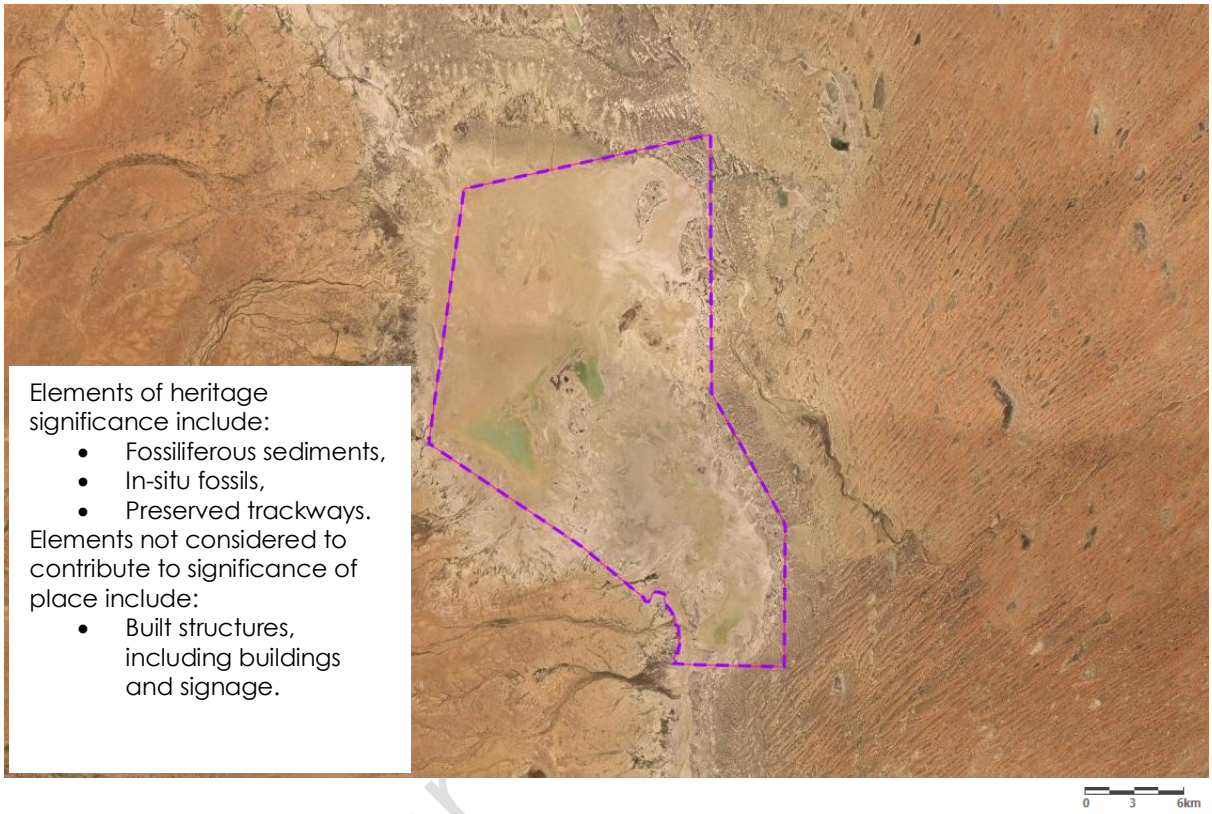
Existing State Heritage Place(s)

*Nearby are the State Heritage Places 'Dwelling - Blanchewater homestead (ruin)' (SHP 13762), 'Arkaroola' (SHP 26404), 'Paralana Hot Springs' (SHP 14815) and 'Bolla Bollana Brick Kiln and Copper Smelter Ruins' (SHP 10317)

SITE PLAN - DETAIL

Lake Callabonna Fossil Reserve
Lindon SA 5731

PLACE NO.: 14268



Lake Callabonna Fossil Reserve, Adnyamathanha and Malyangapa Country, Lindon 5731, CR 5759/715 H833200 S1002 Outside of Hundreds

LEGEND **N ↑**

Parcel boundaries and Elements of Significance (Indicates extent of listing)

PHYSICAL DESCRIPTION

The Lake Callabonna Fossil Reserve is located on Lake Callabonna, an ephemeral lake within the Lake Eyre Basin in the Far North region of South Australia. The Reserve measures 454 km^2 covering most of the lake.

Lake Callabonna itself is part of the Cooper Creek catchment and on rare occasions after heavy rain, water enters the lake from the Strzelecki Creek. When filled, water quality in the lake varies from brackish to fresh.[1] At other times, the lakebed is typically a salt encrusted clay pan.[2]

Fossils are present at the lake within Quaternary-aged (2.5-million-year-old – Present) fossiliferous sedimentary clays and sands of the Millyera Formation. Ripple-marked sands exist between layers of clay, demonstrating previous lake environments.[3]

Lake Callabonna Fossil Reserve is known for its plentiful fossils of a limited range of Late Pleistocene species, dominated by *Diprotodon optatum* (previously considered to be separate species *D. australis* and *D. minor*).[4] Several other extinct animals are represented, namely, *Phascolonus gigas* (giant wombat); *Macropus titan* and *Protemnodon brehus* (ancestral kangaroos); *Sthenurus stirlingi*, *S. tindalei* and *S. andersoni* (ancestral short-faced kangaroos); and, *the emu-like Genyornis newtoni* (extinct large flightless bird).[5] Fossilised wood and plant material such as *Callitris* cones have also been found at the lake.[6] No scavengers or predators are preserved.[7]

Fossil specimens found at Lake Callabonna Fossil Reserve are typically highly intact. Many are encrusted in lime-cemented clays, allowing the preservation of soft body parts such as skin, hair,[8] footpads and feathers.[9] Lake Callabonna Fossil Reserve also demonstrates potential macropodid and diprotodontid trackways, the latter from *Diprotodon optatum,* left behind in mud.[10]

Elements of Significance:

Elements of heritage significance include:

- Fossiliferous sediments,
- In-situ fossils,
- Preserved trackways.

Elements not considered to contribute to significance of place include:

- Built structures including roads, buildings and signage.

HISTORY OF THE PLACE

Geological History

Lake Callabonna forms part of an ancient lake system.[11] During the Pleistocene 2.58 Ma (million years ago) – 12 ka (thousand years ago), Lake Callabonna was likely shallow, exhibiting fluctuating, cyclic water-level changes, possibly brought about by glaciation and interglacial periods,[12] or heavily fluctuating seasonal rainfall.[13] The absence of Pleistocene-aged fish fossils demonstrates that the lake was either too shallow or insufficiently enduring to support aquatic species.[14]

Fossils found at Lake Callabonna Fossil Reserve are predominantly Late Pleistocene (between 70,000 to 40,000 years old).[15] At the time of fossil deposition, the lake was surrounded by a forest or woodland environment, notably inhabited by numerous species of megafauna.[16] It is hypothesised that the lake, when full, may have been an oasis for animals seeking water and food[17] in the rapidly changing and drying climate of the Pleistocene. It is also hypothesised that the clay lakebed acted as a trap, ensnaring large mammals in sediment as they sought water or attempted to cross the lake during periods of low water.[18]

Around 2000-3000 years ago, Lake Callabonna became a permanent lake, supporting water bird species, if only for a relatively short period. During this time, mound springs formed islands in the lake, supporting the nesting of water birds as evidenced by fossil material.[19]

Today Lake Callabonna exists in an arid environment and has only been filled five times between 1895 and 1995. Flooding occurred in 1923, 1930-31, 1950, 1971, and 1974-1975.[20] The lake, on average, receives water once every 20 years, and is unlikely to remain flooded for longer than a year at a time.[21]

Human History

Lake Callabonna Fossil Reserve is a part of Adnyamathanha and Malyangapa Country.[22] Adnyamathanha People lived on the land and possessed a great understanding of the natural landscape and terrain. They had close contact with neighbouring Peoples including for mining and trading ochre. In the 1840s and 1850s, when colonisation of the Far North commenced, many violent encounters occurred between the colonists and Adnyamathanha People. The Adnyamathanha People were noted as being particularly skilled in their use of the landscape to hide and ambush colonial settlers. While there were deaths on both sides, many more Adnyamathanha People were killed.[23]

By 1853, rations were being distributed to the Adnyamathanha People, who due to the control and degradation of the land caused by European practices found it difficult to find sufficient food. During the Victorian gold rush, some Adnyamathanha

People were employed by pastoralists, however, droughts in the 1890s resulted in many pastoralists leaving the land. In the 1930s, a mission was constructed at Nepabunna and many Adnyamathanha People were relocated to live there.[24]

The Adnyamathanha People's determination and cohesion was evident into the 1930s when AP Elkin visited the community. He noted that traditional ceremonies, language and culture remained despite the devastating and lasting effects of colonisation.[25]

Prior to colonisation, the Malyangapa People predominantly lived in the far northwest of New South Wales, though their land extended onto the eastern shores of Lake Callabonna. They had a deep connection to the land and close contact with a number of other First Nations groups. Malyangapa People living in close vicinity to other groups were often bilingual.[26]

Colonisation of Malyangapa land began between 1862-63 and within fifteen years of contact, almost three quarters of Malyangapa People had died.[27] 1930s New South Wales government initiatives further uprooted and restricted the lives of Malyangapa People. Many were forcibly removed from their homes and taken to the Brewarrina Aboriginal Mission, and were threatened with removal of their children if they did not comply with newly implemented laws.[28] Work to revitalise the endangered Malyangapa Language continues today.[29]

Adnyamathanha People know Lake Callabonna as Malakanha, often shortened to Malakanh,[30] meaning a type of string bag. Ancient First Nations artefacts have been found near the lake, including what were believed to be axes and grinding stones.[31] First Nations people were aware of large bones at Lake Callabonna and discussed them with Europeans several times prior to the commencement of formal fossil collection at Lake Callabonna from 1893.[32]

In 1840, Lake Callabonna was observed by European explorer Edward John Eyre. Later in 1844, the lake was visited by Charles Sturt and his party.[33] By1860, the place was known informally as Lake Mullachon (Malakanh[34]) after its First Nations name[35] and was later corrupted to Lake Mulligan.[36]

Fossilised remains of Diprotodon in Australia were known to Europeans from the late 1830s, published by Naturalist Richard Owen[37] In 1870 'The Museum Board' now replaced by the 'Board of the South Australian Museum' offered a £1000 reward to any person able to recover a complete *Diprotodon* skeleton.

In 1882, Frederick B. Ragless established a homestead with the help of his father John Ragless on Callabonna Station, located east of the lake. Frederick Ragless found *Diprotodon* bones in a nearby well[38] or watercourse approximately 3km from the lake as early as 1885.[39] These were sent to the South Australian Museum, but it appears the discovery was not formally investigated.

In 1889, fossilised bones of Diprotodon were found in Burra, predating the discoveries at Lake Callabonna.[40] While near-complete skeletons were found at Burra they lacked important features such as preserved feet.

In 1892, a First Nations stockman known as Jacky Nolan (sometimes spelled Jackie) showed Ragless bones which he had found on the Lake Callabonna lakebed.[41] While Ragless prepared to take a collection of fossil specimens from the lake to Adelaide,[42] one of his employees, John Meldrum, returned to the site to make his own collection. Meldrum later exhibited his fossils in Adelaide, causing a dispute over the £1000 reward.[43]

In 1893, the South Australian Museum began collecting fossils from Lake Callabonna, led by Queensland geologist Henry Hurst accompanied by his brother George and John Meldrum. This was only the second exploration of its kind for vertebrate fossils in Australia and resulted in the collection of a large quantity of fossils. Particularly impressive finds from this expedition were a juvenile *Diprotodon* preserved together with its mother[44] and mammal trackways. Hurst's collection totalled twenty-eight wooden cases of bone material. The success of Hurst's exploration led to suggestions that the area should be recognised as a reserve.[45]

Later that year, Dr Edward Charles Stirling, Hon. Director of the South Australian Museum, visited Hurst's camp and noted his dissatisfaction with the collection methods used by Hurst and his team. The fossils had been packaged poorly for transport, resulting in damage, and Hurst had focused on collecting as many bones as possible, rather than collecting associated bones together.

Stirling replaced Hurst with his assistant A. H. C. Zietz, who soon set out with his own team to procure further fossils. The expedition experienced temperatures reaching 49˚ Celsius, sandstorms, heavy rain and had difficulty locating food and water.[46] Nevertheless, Zeitz collected two complete adult *Diprotodon* specimens and a second juvenile *Diprotodon;* [47] two skeletons of extinct kangaroos; one of a giant wombat; and an articulated and near-complete *Genyornis* skeleton, the only of its kind to be found.[48] The collection totalled sixty wooden cases of fossilised bone material.

Over the course of the two expeditions in 1893, fossilised bones of approximately 80 individual *Diprotodon* were collected, the first examples of *Diprotodon* feet known to science were found,[49] as were articulated examples of the *Diprotodon* foot bones.[50] Frederick Ragless officially won the £1000 reward for the discovery of a complete *Diprotodon* specimen, however, due to the cost of the expeditions to the lake, the Museum Board at the time could not afford to pay him the prize money.[51] In 1894, Stirling decided the lake would be formally renamed Lake Callabonna, as he wrongly believed that Mulligan was not a First Nations name.[52] Callabonna derives from kardla (fire) and pirna (big). When spoken, this becomes karla-pirna, thus Callabonna.[53]

In 1900, Lake Callabonna was described as a 'veritable necropolis' due to the abundance of fossils present.[54] On 5 December 1901, Lake Callabonna was gazetted as the Lake Callabonna Fossil Reserve. It is believed that this was the first such reserve in Australia and one of the first in the world.[55] A few years later in 1907, the first complete fossil skeleton of a *Diprotodon* from the Lake Callabonna collections was unveiled to the public.

After the initial excitement of the 1890s, Lake Callabonna was visited and researched less frequently. Site visits occurred in 1928 and 1948. It is unknown what was collected during the 1928 visit and similarly appears that little, if anything, was collected in the 1948 visit.[56] In 1953, American palaeontologist Prof. Ruben Arthur Stirton and then-student, Richard H. Tedford re-evaluated the site and collected several more *Diprotodon* specimens. This expedition has been referred to as 'the beginning of modern mammalian palaeontology in Australia'. Tedford returned in 1970 and identified further *Diprotodon, Genyornis, Phascolonus, Protemnodon* and *Sthenurus* specimens. In 1983, further searches for *Genyornis* specimens by Dr Thomas Rich and Prof. Patricia Arlene Vickers-Rich AO were unsuccessful.[57]

The Lake Callabonna Fossil Reserve was recognised by the South Australian Division of the Geological Society of Australia in 1977 but not assigned an official number. In 1980, the place was added to the now-defunct Register of the National Estate as 'Lake Callabonna Reserve'. In 1984, the place was revisited by the South Australian Division of the Geological Society of Australia and officially recognised as a Geological Monument, named 'Lake Callabonna Fossil Reserve'.

In 1989, Heritage SA received a nomination for the Lake Callabonna Fossil Reserve to be considered for State Heritage-listing and the place was recommended by the SA Heritage Committee for heritage listing. In 1996, the Lake Callabonna Fossil Reserve was provisionally entered in the South Australian Heritage Register and the following year it was confirmed as a State Heritage Place.

The large number of specimens collected from Lake Callabonna continue to support Australian vertebrate research into the twenty-first century. Evidence from Lake Callabonna demonstrates that megafauna such as *Diprotodon* existed in the Australian environment into the Holocene, until ~7500 years ago.[58] Gut contents of *Diprotodon* have been identified as saltbush (*Amaranthaceae*)[59] or bluebush[60], which may refer to a suite of plants, and *Nyctaginaceae*.[61] *Diprotodon* gut contents have been dated to a minimum of >53,400 thousand years old.[62]

Gizzard stones identified from *Genyornis* also demonstrate the life habit of the giant birds.[63] The feet of many organisms are particularly well-preserved, often with the body lying on or slightly to the side of the feet,[64] demonstrating that the vertebrates may have become trapped in clays of the lakebeds and died there.[65] The discovery of multiple *Genyornis* skeletons together also provide insights into the potential of

herd-living, similar to present-day emus.[66] As of 2009, only seven sites in the southern Lake Eyre basin, including Lake Callabonna, have yielded *Genyornis* bone.[67] Several complete and near-complete *Diprotodon* skeletons, as well as evidence of juvenile *Diprotodon,* have been recovered from the site.[68]

Trackways of Cenozoic mammals are extremely rare in Australia.[69] Lake Callabonna is one of only seven Cenozoic sites with mammal trackways thus far discovered in Australia, the others being Willandra Lakes (NSW), a single site containing human and kangaroo tracks, Fowlers Bay (SA), two sites at Clare Bay (SA) one of which has human tracks, Warburton River (SA), volcanic plains in Victoria,[70] on Kangaroo Island (SA)[71] and human tracks near Broome (WA).[72]

Evidence of fossilised plant life including fruit, wood and pollen from species such as *Eucalyptus*, *Callitris,* saltbush and wattles has also been recovered from Lake Callabonna,[73] however, the significance of these findings was not recognised when the place was listed as a State Heritage Place.

Recent expeditions in 2013, 2014, 2018 and 2019 by Flinders University have provided further specimens,[74] and new species have been identified from Lake Callabonna fossils as recently as April 2024.[75]

A composite, articulated specimen of a *Diprotodon optatum* currently on display at the South Australian Museum was originally found and excavated from the Lake Callabonna site.[76] When added to the Register of the National Estate in 1980, Lake Callabonna was the only Quaternary fossil site in Australia to have such consistently recovered and abundant articulated extinct fossil vertebrates.[77] Today, the site is closely rivalled in South Australia by the Naracoorte Caves Complex (SHP 26459) as a source of extinct vertebrate fossils.

Aboriginal Cultural Considerations

The *Heritage Places Act 1993* makes provision for the identification, recording and conservation of places and objects of non-Aboriginal heritage significance. The protection and preservation of Aboriginal heritage is provided for under the *Aboriginal Heritage Act 1988*. Contact the Aboriginal Heritage Unit for listings.

CHRONOLOGY

Year	Event
2.58 Ma – 12 ka	Pleistocene epoch.
70 ka	Likely maximum age of fossils from Lake Callabonna.
>53.4 ka	Likely minimum age of fossils at Lake Callabonna.
7.5 ka	Likely complete extinction of *Diprotodon*.
1840	Edward John Eyre observes Lake Callabonna from the top of Mount Hopeless.
1844	Charles Sturt visits Lake Callabonna.
1860	Informal use of the name 'Lake Mullachon' to refer to Lake Callabonna, this is later corrupted to Lake Mulligan.
1882	Frederick B. Ragless and John Ragless establish a homestead near Lake Callabonna.
1889	Near complete fossilised skeletons of *Diprotodon* are found at Burra but lack critical features such as feet.
1892	Fossil specimens of *Diprotodon* found at Lake Callabonna.
1893	13 January - August, Henry Hurst leads the first expedition to Lake Callabonna. Late August, A. H. C. Zietz leads the second expedition to Lake Callabonna.
1894	Dr E.C. Stirling renames the lake, Lake Callabonna.
1901	5 December, Lake Callabonna gazetted as the Lake Callabonna Fossil Reserve.
1907	First complete *Diprotodon* skeleton unveiled.[78]
1928	Robert Bedford, associated with the Kyancutta Museum visits Lake Callabonna.
1948	H.O. Fletcher, associated with the Australian Museum, visits Lake Callabonna.
1953	Professor R. A. Stirton and student R. H. Tedford visit Lake Callabonna.
1970	Tedford revisits Lake Callabonna in association with the Smithsonian Institution and the South Australian Museum.

1983	T. Rich and P. Vickers-Rich, with support from the Australian Army, visit Lake Callabonna looking for *Genyornis* specimens.
1984	Lake Callabonna is recognised as a Geological Monument by the Geological Society of Australia's South Australian Division.
1989	16 November – Nomination received.
	20 December – Recommended by the SA Heritage Committee (Under SA Heritage Act 1978).
1996	10 October – Provisionally entered in the South Australian Heritage Register, Designated as a place of Palaeontological significance.
1997	13 February – Confirmed in the South Australian Heritage Register.
2013-2019	Several expeditions to lake Callabonna are facilitated by Flinders University.
2015	Adnyamathanha Native Title Determination registered for part of Lake Callabonna.
2021	Malyangapa Part A Native Title Claim registered for part of Lake Callabonna.
2024	ABC-produced television series *Catalyst* features a documentary featuring Lake Callabonna, "Megafauna: What Killed Australia's Giants?"

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SITE DETAILS

Lake Callabonna Fossil Reserve **PLACE NO.: 14268**

Lindon SA 5731

DESCRIPTION OF PLACE:	Dried lake containing abundant fossil fauna	
HISTORIC THEME/S	Theme 1 Natural Environment 1.2 Tracing the evolution of plants and animals	
DATE OF CONSTRUCTION:	Approx. 70,000 to 40,000 years old (Fossils)	
REGISTER STATUS:	Nominated received 16 November 1989 Recommended by SA Heritage Committee 20 December 1989 Provisionally Entered and designated as a place of palaeontological significance 10 October 1996 Confirmed 13 February 1997	
CURRENT USE:	Dedicated Fossil Reserve, Geological Monument	
LOCAL GOVERNMENT AREA:	Pastoral Unincorporated Area	
LOCATION:	**Street No.:**	NA
	Street Name:	NA
	Town/Suburb:	Lindon
	Post Code:	5731
LAND DESCRIPTION:	**Title Reference:**	CR 5759/715 H833200 S1002
	Hundred:	Outside of Hundreds

PHOTOS

Lake Callabonna Fossil Reserve **PLACE NO.: 14268**

Lindon SA 5731

Diprotodon trackways preserved on the lake-surface at Lake Callabonna. Richard H. Tedford pictured beside them.[1] c.1999

Source: DEW Files

REVISIONS

Date	Changes
13 February 2026	SAHC modified template to include an image at the beginning of the document.

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