LAKE EYRE

An aerial view of Level Post Bay
with Lake Eyre South in the background

Photo: B.Mossel

A. LOCATION

- South Australia, Australia.
- 28:30S, 137:20E; -9.5* m above sea level.
  * At 1974 flood level.

B. DESCRIPTION

Lake Eyre, a great salt lake of tectonic origin, lies asymmetrically in the south-western corner of the closed inland drainage basin in the heart of the Australian continent. With an area of 1,140,000 km2, Lake Eyre Basin is the largest Australian drainage division apart from the Western Plateau and is one of the largest areas of internal drainage in the world. The lake, whose lowest parts lie 15.2 m below sea level, consists of two sections. Lake Eyre North, 144 km long and 77 km wide, is joined by the narrow Goyder Channel to Lake Eyre South, which is 64 km long and 24 km in width. Not so long ago it was considered to be permanently dry, but the last forty years have witnessed some twenty flood events, with the most spectacular fillings occurring in 1950, 1974 and 1984.

The deepest region of Lake Eyre North is the eastern part of Belt Bay in which bottom levels were found the lowest point on the Australian continent. The floor of the lake is very flat, therefore the definition of the exact location is rather

difficult. The shores of the lake are well defined and consist of sand dunes, cliffs of eroded gypseous loam or low rocky escarpments. The south-eastern coastline, which consists of sand cliffs, is being rapidly cut back, with an erosion rate in the order of 5 m per flooding.

Trustworthy data on the filling of Lake Eyre South are reported for the floodings of 1938, 1955, 1963, 1968, 1973, 1974, 1975, 1976 and 1984. In 1984 Lake Eyre South overflowed to Lake Eyre North. In 1974 water flowed from Lake Eyre North to Lake Eyre South between March and October when an equilibrium level was obtained. Large quantities of salt, estimated at 30 million tons (7.5% of Lake Eyre North content), were transferred into Lake Eyre South during this event, creating, in its lowest portion, a salt crust up to 290 mm thick for the first time on record.

The vast catchment areas of the lakes are only marginally desert and as such are very responsive to even slight variations of rainfall. Considering the long term trends of climatic change is therefore essential. Almost all the non-desert parts of the Lake Eyre Basin area are used for low-intensity grazing of sheep for wool and beef cattle. The very variable rainfall is the most important factor for provision of feed, and low rainfall seasons determine stocking rates. Grazing capacity is directly related to the distribution of artesian wells and excavated tanks. The area of irrigated agriculture is insignificant and restricted to pasture on lands bordering other divisions (l).

C. PHYSICAL DIMENSIONS (Q, 1)

Basin	North	South	Total
Surface area [km2]	8,430	1,260	9,690
Volume [km3]	27.7	2.4	30.1
Maximum depth [m]	5.7	3.7	-
Mean depth [m]	3.3	1.9	-
Water level			Unregulated
Normal range of annual water level fluctuation [m]	-	-	2
Length of shoreline [km]	1,390	328	1,718
Catchment area [km2]	-	-	1,140,000

D.PHYSIOGRAPHIC FEATURES

D1 GEOGRAPHICAL

- Sketch map: Fig. OCE-04-01.
- Bathymetric map: Fig. OCE-04-02.
- Names of main islands: Brooks and Dulhunty.
- Number of outflowing rivers and channels (name): None.

D2 CLIMATIC (2)

- Climatic data at Oodnadatta, 1920-1970

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Mean temp. [deg C]	29.3	28.3	26.2	20.5	26.0	12.7	12.4	14.2	18.7	22.1	25.5	28.7	21.2
Precipitation [mm]	18	34	18	6	16	10	12	10	7	12	8	15	167

- Number of hours of bright sunshine: 3,410 hr yr-1.
- Solar radiation (Alice Springs, 1920-1970): 21.8 MJ m-2 day-1.

Fig. OCE-04-01
Sketch map of the catchment area with median annual precipitation (1883-1983)[mm](1).

Fig. OCE-04-02
Bathymetric map (1).

Fig. OCE-04-03
Elevation/volume curve of the lake (1).

Fig. OCE-04-04
Elevation/surface area curve of the lake (1).

Fig. OCE-04-05
Seasonal change of meteorological conditions in the catchment area, 1984.

Fig. OCE-04-06
Past trend of filling levels (1).

Fig. OCE-04-07
Past trend of annual inflow to Lake Eyre North (1).

- Water temperature [deg C](1) (1974-1983)

	Min	Max	Ann.
Cooper Creek*1	13.0	21.0	22.6
Diamantina R.*2	30.0	33.0	24.8

*1 Innamincka. *2 Birdsville.

- Mixing type: None

E. LAKE WATER QUALITY

E2 pH (1)

July 1978 and 1983

	Min	Max	Ann.
Cooper Creek*1	7.1	8.7	7.8
Diamantina R.*2	7.5	7.9	7.7

*1 Innamincka. *2 Birdsville.

E3 SS [mg l-1](1)

July 1978 and June 1983

	Min	Max	Ann.
Cooper Creek*1	19	140	50
Diamantina R.*2	244	684	442

*1 Innamincka. *2 Birdsville.

E4 DO [mg l-1](1)

1980 and 1983

	Min	Max	Ann.
Cooper Creek*1	5.8	10.8	8.2
Diamantina R.*2	6.4	8.3	7.2

*1 Innamincka. *2 Birdsville.

E7 NITROGEN CONCENTRATION (1)

- NH4-N [mg l-1]

  July 1978 and June 1983

	Min	Max	Ann.
Cooper Creek*1	0.07	0.07	0.07
Diamantina R.*2	0.04	0.52	0.19

*1 Innamincka. *2 Birdsville.

- NO3-N [mg l-1]

  July 1978 and June 1983

	Min	Max	Ann.
Cooper Creek*1	0.01	0.57	0.20
Diamantina R.*2	0.10	0.26	0.18

- Total-N [mg l-1]

  July 1978 and June 1983

	Min	Max	Ann.
Cooper Creek*1	0.72	1.12	0.93
Diamantina R.*2	0.71	1.20	1.01

*1 Innamincka. *2 Birdsville.

E8 PHOSPHORUS CONCENTRATION (1)

- PO4-P [mg l-1]

  July 1978 and June 1983

	Min	Max	Ann.
Cooper Creek*1	0.12	0.34	0.20
Diamantina R.*2	0.15	0.21	0.20

*1 Innamincka. *2 Birdsville.

- Total-P [mg l-1](1)

  July 1978 and June 1983

	Min	Max	Ann.
Cooper Creek*1	0.25	0.91	0.42
Diamantina R.*2	0.25	0.81	0.60

*1 Innamincka. *2 Birdsville.

E9 CHLORIDE CONCENTRATION [mg l-1](3) (1984)

Date	Salinity	Na	K	Ca	Mg	Cl	SO4	HCO3	CO3
14 Feb	25,331	9,114	<1	545	53	14,290	1,274	55	0
28 Mar	40,989	14,620	70	876	150	23,000	2,140	35	7
30 Mar	42,355	15,150	93	887	143	23,350	2,700	32	0
30 Apr	49,023	17,520	70	1,050	171	27,220	2,950	42	0
7 May	51,301	18,400	46	1,040	187	28,300	3,280	48	0
28 May	57,728	20,640	48	1,240	193	31,880	3,670	57	0
25 Jun	61,278	21,970	49	1,350	173	34,360	3,310	66	0
21 Jul	64,969	23,230	92	1,350	236	35,910	4,070	81	0
27 Aug	71,248	25,500	136	1,450	264	39,640	4,170	88	0
24 Sep	86,710	31,200	68	1,680	310	48,100	5,290	62	0
28 Oct	117,797	42,600	111	2,050	451	65,700	6,820	65	0
30 Oct	120,067	43,800	111	1,820	473	67,500	6,300	63	0
26 Nov	162,697	60,300	129	1,650	725	93,100	6,720	73	0
17 Dec	217,350	82,000	208	1,220	874	126,200	6,800	48	0
16 Jan*	272,819	101,300	555	459	2,500	155,600	12,300	105	0

* 1985.

F. BIOLOGICAL FEATURES

F1 FLORA (4)

- Emerged macrophytes
  Cyperus gymnocaulos, Typha domingensis, Phragmites australis.
- Submerged macrophytes
  Potamogeton sp., Halosarcia spp., Sclerostegia spp., Eriocaulon carsonii, Gahnia trifida, Machaerina juncea.

F2 FAUNA

- Zooplankton (3)
  Brachionus plicatilis, Parartemia minuta, Moina baylyi, Daphniopsis sp., Microcyclops platypus, Microcyclops sp.
- Benthos (3, 4)
  Heterocypris sp., Diacypris sp., Trigonocypris glabulosa, Reticypris kurdimurka, Mytilocypris splendida, Ngarawa dirga, Phreatomerus latipes, Afrochiltonia spp., Paracylops sp.
- Fish (3, 4)
  Chlamydogobius eremius, Neosilurus sp., Craterocephalus dalhousiensis, C. eyresii, Gambusia affinis, Cherax destructor, Caridina thermophila.

G. SOCIO-ECONOMIC CONDITIONS

G1 LAND USE IN THE CATCHMENT AREA (1) (1986)

- Types of important landscape: Scattered pasture and sandhill desert.
- Types of important natural vegetation: None.
- Main kinds of crops: Grass.
- Levels of fertilizer application on crop fields: Low.

G2 INDUSTRIES IN THE CATCHMENT AREA AND THE LAKE (1) (1980)

	No. of establishments
Primary industry	
- Extensive stock raising	1,367
Secondary industry	None
Tertiary industry	None

- Numbers of domestic animals in the catchment area
  Cattle 1,424,000, sheep 4,390,000.

G3 POPULATION IN THE CATCHMENT AREA (5)

	Population	Population density [km-2]	Major cities (population)
Rural	35,000	Alice Springs (22,800)	
Total	50,000	0.04	

H. LAKE UTILIZATION

H1 LAKE UTILIZATION (1)

Source of water.

I. DETERIORATION OF LAKE ENVIRONMENTS AND HAZARDS

I1 ENHANCED SILTATION (1)

- Extent of damage: Heavy siltation, but no damage.

I2 TOXIC CONTAMINATION (1) (1978, 1983)

- Present status: Analyzed, but not detected.
- Water quality standards for freshwater sources (6)

Item	Limit concentration [mg l-1]	Item	concentration [mg l-1]
As	0.05	Pesticides	
Ba	1.0	- Endrin	0.001
B	1.0	- Chlordane	0.001
Cd	0.01	- Toxaphene	0.001
Cl	250	- Organic phosphates	0.05
Cr(6+)	0.05	- Organic chlorides	0.01
Cu	1.0	- Carbides	0.1
CN	0.05	- Hydrocarbon fluorides	0.001
F	1.5	Herbicides	
Fe(filtrable)	0.3	- 2,4-D	0.1
Pb	0.05	- 2,4,5-T	0.1
Mn(filtrable)	0.05	- Phenylurea	0.1

Hg	0.001	- Triazine	0.1
MBAS	0.5	- Dipyridyl	0.1
NH3-N	0.5	- Acrolein	0.1
Phenol	0.001		

I3 EUTROPHICATION (1)

- Nuisance caused by eutrophication: None.

I4 ACIDIFICATION (1)

- Extent of damage: None.

J. WASTEWATER TREATMENTS

J1 GENERATION OF POLLUTANTS IN THE CATCHMENT AREA (1)

(a) Pristine lake environments.

K. IMPROVEMENT WORKS IN THE LAKE (1)

None.

L. DEVELOPMENT PLANS (1)

None.

M. LEGISLATIVE AND INSTITUTIONAL MEASURES FOR UPGRADING LAKE ENVIRONMENTS

M1 NATIONAL AND LOCAL LAWS CONCERNED (6)

- Names of the laws concerned (the year of legislation)
    1. Clean Water Act (1970)
    2. State Pollution Control Commission Act (1970)
    3. Clean Waters Regulations (1972)
- Responsible authorities (6)
    1. State Government
    2. State Pollution Control Commission

N. SOURCES OF DATA

Q. Data supplied by Dr. V. Kotwicki, Engineering and Water Supply Department, State Administration Centre, Adelaide and Dr. D. Corcoran, Australian Embassy, Tokyo.

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