



MITCH WILLIAMS MP

STATE MEMBER FOR MACKILLOP

9 September 2008

To The Secretary
Senate Standing Committee on Rural and Regional Affairs and Transport
Parliament House
CANBERRA ACT 2600

Submission to the Inquiry into water management in the Coorong and Lower Lakes

Over 90% of South Australia's population use the River Murray for their domestic water supply either to wholly supply or supplement other water sources.

The city of Adelaide relies substantially on the River Murray's waters to supplement its annual average use. In an average year we pump 88,000 megalitres of water from the river and in a dry year 179,000 megalitres¹. This is a small percentage of the water taken legally from the river in any given year.

Irrigation from the South Australian sector of the River Murray is of vital importance to the State's economy and with all South Australian irrigation water licences being high security, a greater proportion of irrigated crops in South Australia are permanent rather than annual plantings.

The three key irrigation regions the Riverland, the Murraylands and the Lower Murray have all been severely impacted by the current low water flows. Water restrictions and reduced irrigation allocations have contributed to the Riverland's horticultural value shrinking from \$1.56 billion in 2002 to \$1.01 billion in 2006².

The Murraylands region's gross food revenue of \$949.2 million in 2005/06 represents 9.4 percent of the state's gross food revenue³.

The Lower Murray accounts for 22 percent of dairy farmers in the State and around 20 percent of the total milk production. The drought has seen the closure of over 70 percent of dairy farms, as a result stock have been culled. These are prime herds which will take years to replenish.

The Lower Murray wine growing region of Langhorne Creek is one of the largest regions in South Australia, producing 30% of the State's wine grapes⁴. Without water this industry is under serious threat. Because of the declining levels in the Lakes and the rising salinity, water is both inaccessible and unusable to the wine grape growers of Langhorne Creek.

¹ Waterproofing Adelaide Strategy 2005-06 p.13

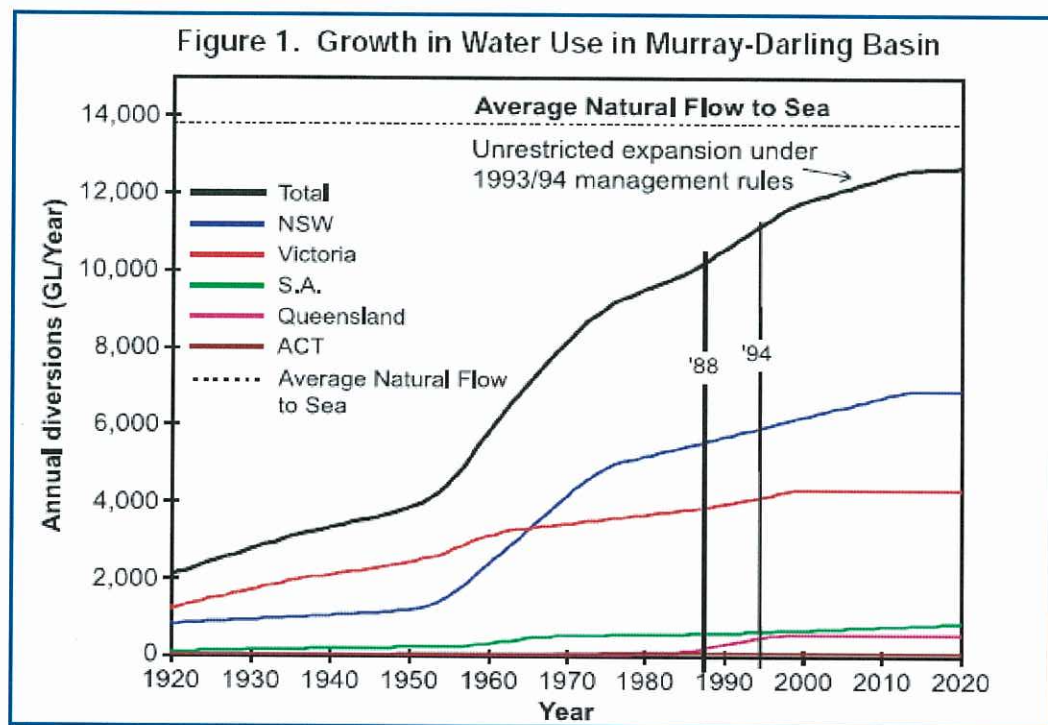
² PIRSA Scorecard

³ Economic Outlook Report 3 – Regional Investment Opportunities, econsearch, November 2007.

⁴ Wine Industry ScoreCard November 2007, PIRSA

The South Australian Liberal Opposition believes that the drought is only part of the problem in our current water crisis. As illustrated in the graph below the total annual diversions from the River have been rapidly increasing since the early 1950s.

Total extractions have continued to rise (seemingly unabated) even since the recognition in the 1990s that signs of over use had become apparent with Basin states agreeing to putting a cap on surface water diversions in June 1995 at the 1993/94 extraction level.



Source: Murray Darling Basin Commission

In 2003 the Murray Darling Basin Commission published the document *Projections of Groundwater Extraction Rates and Implications for Future Demand and Competition for Surface Water*. The document highlights the connectivity between groundwater systems and surface water in the system. The analysis contained therein, estimates that groundwater extractions were reducing streamflows within the basin by 186 GL/yr by the year 2000 and predicted this impact to rise to the order of 700 GL/yr by 2050 with no further increase in groundwater extractions. Already these predictions have been seriously compromised.

The key recommendations of this study are that the State's should reduce groundwater allocations to sustainable yield levels and that in the short term groundwater should be accounted for in the spirit of the cap. In the longer term a new cap incorporating surface water and groundwater extractions should be implemented.

Unfortunately the July 2008 Intergovernmental Agreement provides for such a regime to only be implemented by 2011 some eight years after the recommendations were made.

Undoubtedly, the reticence of State Governments to act on such recommendations made to them, combined with the impact of the current drought, provided the catalyst

for the Howard Federal Government's bid to take over management of the River system.

We strongly support a Federal Government's take over of the Basin system, however we do not believe that the Intergovernmental Agreement on Murray-Darling Basin goes far enough.

The Agreement simply enshrines the status quo where parochial interests will continue to outweigh national interests and certainly the interests of the environment. This is illustrated by the fact that in times of historically low flows we see water being used to grow annual crops while permanent plantings are being left to die.

It is apparent that the environment's water needs have been rated much lower than those of other stakeholders. As streamflows reduce environmental flows disappear and any available water is distributed firstly to fulfil domestic needs, albeit to a restricted use level, and thereafter to irrigators.

It is imperative that the environment receive a share of the streamflows and that the integrity of this share is at least on equal status with irrigation shares.

All of the environmentally significant sites along the River, not just the Lower Lakes and Coorong, must be protected from low flows and salinisation. We need to make sure water is available to maintain red gum forests and we need to ensure a river flow regime which more accurately reflects natural flows. This will encourage wetting and drying of wetlands and river flats.

It is imperative that we take every possible measure in the short term to maintain the fresh water integrity of the Lower Lakes. We believe that it is not an option to allow portions of the system, such as the Lower Lakes, to be subject to irreversible damage. It may well take a combination of the options that have been outlined in the Department of Environment, Water, Heritage and the Arts' submission to this Inquiry to maintain the integrity of the Lakes.

In particular this submission addresses your Inquiry's Terms of Reference 1d and 2 a,c and d.

Term of Reference 1d: any other related matters

We wish to present for your consideration evidence which we believe refutes the misconception that the Lower Lakes, Lakes Alexandrina and Albert were tidal and saline historically:

- a) Murray Darling Basin Commission Technical Report 2001/11 *Options for Water Savings from the Lower Lakes for improved flows in the Coorong and through the Murray Mouth* states:

"1.2 Historic Lake and River Mouth Conditions

Under natural flow conditions, prior to the implementation of regulation and diversions throughout the Murray-Darling Basin, Lakes Alexandrina and Albert were predominantly fresh water lakes, only becoming brackish or saline at times of low river flow. It is evident from the original fringing vegetation, the

ecology of the lakes and the fact that irrigation and domestic water supplies were being drawn from the lakes, that there were no substantial concerns about salinity in the lakes until upstream irrigation demands began to increase. Effectively the natural river flow negated the tidal influence throughout this area at most times.

It is also evident from photographs and historical accounts of the river and the lakes that the normal water level was dominated by freshwater flows and was substantially higher than would be expected if the level was dictated by tides alone. The higher natural flows would have been sufficient to back the water levels up to the current levels in many years. As a consequence the lake evaporation before the Barrages were built was not substantially less than that under current conditions.”

- b) The River Murray Catchment Water Management Board 2004 publication *A Fresh History of the Lakes: Wellington to the Murray Mouth, 1800s to 1935* by Terry Sim and Kerri Miller states:

“Prior to European settlement, Lakes Alexandrina and Albert at the terminus of the River Murray were predominately fresh, with river water discharging to sea and keeping the Mouth clear. Contrary to what many believe today, saltwater intrusions into the Lake environment were not common until after 1900 when significant water resource development had occurred in the River Murray system.

Before large-scale extractions of water, the Lakes and lower Murray were rarely subjected to seawater invasions. Long time Goolwa resident Edward Leslie Goode told an enquiry in 1933 ‘I can remember when it was a remarkable thing when saltwater came up to the Goolwa wharf. Now we see saltwater in the lakes for months’.

Short-lived intrusions of saltwater would occur during periods of low flow down river resulting in a lowered level of water in the lakes. Even in times of these low flows, it would appear that only small areas of the Lakes (immediately around the Murray Mouth and into the channels towards Point Sturt for a short distance) were affected. Winds could blow salt water into the main body of Lake Alexandrina for short periods but when the wind ceased to blow, the flow of water downstream pushed the saline water back out of the Mouth.”

- c) A more recent paper Discussion Paper by Bruce Brooks and Mike South dated 19th August 2008 *Applying a localised Water Balance approach to estimate Losses from Lake Alexandrina and Lake Albert for the Years 1970 to 2006.*

This discussion paper which is currently under peer review highlights the fact that the total evaporation losses from the Lower Lakes do not equal the loss of water delivered to the Lakes from the River Murray. The paper argues that local rainfall and inflows from the Eastern Mount Lofty Ranges mean that the net loss to the River via evaporation from the Lower Lakes is considerably less than previously accepted. The paper argues that the net loss from the Lower Lakes is close to a median value of 400GL/yr.

Term of Reference 2a: the adequacy of current whole-of-basin governance arrangements under the Intergovernmental Agreement

We believe that the Governance arrangements under the Intergovernmental Agreement fail to change the status quo leaving powers with individual states to at least frustrate if not prevent necessary changes.

Our concerns include the continuing role of State Water Ministers via the Ministerial Council and the omission of a truly independent scientifically based advisory body. The timeframes set out in the agreement ensure that no actions will be taken for at least three years when urgent action is required immediately. The South Australian Opposition's position is that the State's should refer the necessary powers to the Commonwealth to allow for a whole of Basin Water Plan providing a holistic cap (including both groundwater and surface water) for all streams within the Basin, with this plan being developed by a truly independent scientifically based body.

Furthermore, we are concerned that the arrangements under the IGA fail to recognise the urgency of the problems facing the Basin and its environment. We believe the whole of Basin Plan is required urgently, well before 2011 and would urge the imposition of interim caps as an immediate measure.

Similarly the proposed buyback from willing sellers on an ad hoc basis seems to be fraught with danger. It appears that there is no plan to:

1. Ensure that such buyback does not unfairly impact on individual communities
2. Co-ordinate the plan to buyback allocation with the plans to upgrade water delivery infrastructure
3. Target those catchments which are more severely over-allocated with particular consideration to both surface water and ground water extractions.

The South Australian Opposition has called for an immediate reduction in all water allocations equivalent to 6.1% to be fully compensated at current market rates plus full compensation for any capital gains implications.

This would recover 750 gigalitres of water from allocation.

Term of Reference 2c: long-term prospects for the management of Ramsar wetlands including the supply of adequate environmental flows

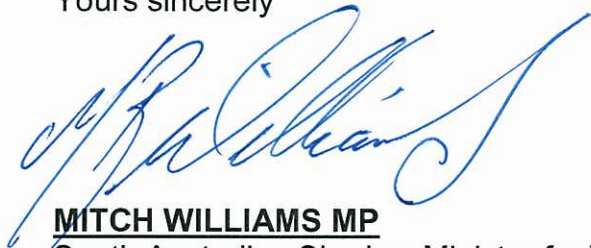
Our earlier comments in reference to your term of reference 1d also relate to this term of reference. We have already contended that the Lower Lakes had historically been fresh water and as such the associated ecosystems have always been fresh water based. We believe that it is imperative that the integrity of these ecosystems is maintained and that a high priority should be placed on maintaining environmental flows to support this integrity.

Term of Reference 2d: the risks to the basin posed by unregulated water interception activities and water theft

We believe that no water should be diverted from the stream flow unless it is regulated and metered and that all diversions fall within a cap which is designed to maintain the environmental integrity of the whole of the Basin.

The documents quoted in this submission are appended in addition to the South Australian Liberal Opposition's July 2008 Policy Statement *Saving the Murray Darling Basin What Must Be Done*.

Yours sincerely



MITCH WILLIAMS MP

South Australian Shadow Minister for Water Security

Applying a localised Water Balance approach to estimate losses from Lake Alexandrina and Lake Albert for the years 1970 to 2006

Discussion Paper 19 August 2008

Authors:

Bruce Brooks B Sc (Hons). Dip Met.

Retired: Manager Climate Services

South Australian Regional Office

Bureau of Meteorology

Contact details:

RSD 3 Finnis SA 5255

E-mail: jbrooks@bigpond.com

Telephone: 0417891909

Mike South B Ag Sc, Grad Dip Bus Admin,

Retired: AFAIM, CMC

Formerly Business Development Manager & Deputy to the Director

Cooperative Research Centre for Soil and Land Management

Contact details:

Point Sturt SA 5256

E-mail: mlhsouth@activ8.net.au

Telephone: 08 85370332

Executive Summary

- **This Discussion Paper ('Paper') argues that total evaporation from Lake Alexandrina and Lake Albert does not equate to total losses from these lakes. There are many integrated processes occurring on the Lower Lakes, such as rainfall and local stream inflows, and these cannot be ignored when considering the losses from Lake Alexandrina and Lake Albert.**
- **When considered as water storage lakes, Lake Alexandrina and Lake Albert collectively lose close to a median value of 400GL of water per annum.**
- **This estimate is considerably lower than other estimates of losses, which consider evaporation alone.**
- **Data for the Lower Lakes indicates that, in a median year, Lake Alexandrina and Lake Albert together receive some 330GL from rain falling on the surface of the lakes. They also receive an estimated 114.5GL of water from the eastern Mt Lofty streams which flow into Lake Alexandrina.**
- **It is submitted in this Paper that the evaporation from a large lake area such as the Lake Alexandrina and Lake Albert is not as great as for a Class A evaporation pan. Class A pans receive radiant heat through the sides of the vessel, whereas this is not the case in a large lake area. Thus, taken in isolation, the Class A pan reading will result in an over estimate of the evaporation from a large lake area.**
- **This Paper stresses the importance of a holistic appreciation of the integrated environmental processes, and as such argues the benefits of the Water Balance approach.**

Purpose of the Paper

The purpose of this Paper is to argue that the total evaporation from the Lower Lakes does not equate to total losses from the Lower Lakes. Processes such as rainfall and local stream inflows cannot be ignored when considering water losses from Lake Alexandrina and Lake Albert. This Paper will use data from a 37 year period, from 1970 to 2006.

Expert advice has been sought and received on the methodology contained within this Paper. The expert advice confirms that the methodology contained within the Paper appears to be in order. However, the results obtained from the methodology contained within this Paper differ from the results obtained by the users of BIGMOD. BIGMOD is a computer simulation model used by the Murray Darling Basin Commission and has been used to estimate evaporation from the Lakes. Hence, the opinion of others is currently being sought, including those who developed and use BIGMOD, in order to receive any further evaluation or criticism of the methodology. If the methodology is confirmed as appropriate, an attempt to reconcile any discrepancies with BIGMOD will be made.

Once these attempts to reconcile any discrepancies have been made, the information contained within this Paper will be included in an Information Sheet on the Lower Murray. This Information Sheet is currently under development, and the draft of relevant sections is attached as Appendix 2.

Background

Since late 2006, a number of residents, including families that have lived in the Lower Lakes region for a number of generations, have expressed concern regarding predictions provided by Government Departments on water loss from the lakes. These predictions are apparently based on BIGMOD, and may not be true representation of the situation.

Specific concerns include:

- That anecdotal and historic rises in lake levels resulting from localised rainfall events both on the lakes and the surrounding catchments do not appear to be reflected under the BIGMOD model;
- That variations in localised inflows from the wettest to driest years are of great ecological significance, and that the use of median, average or worst case scenarios ignore this variation and consequent environmental value;
- That evaporation as reported in the Media ranging from 1000GL to 1400GL are likely to be over estimations, and that in some cases these estimations are being confirmed publicly by a number of people in positions of authority and as such these estimations are gaining credibility in the general populace;
- That the Department for Water Land, and Biodiversity Conservation's ('DWLBC') estimations of annual losses in the order of 750GL to 850GL appear to be at variance to that reported in the Media, however there has been no clarification or correction offered by DWLBC; and
- That important decisions regarding the future of the Lower Lakes could be based on incomplete, or possibly flawed, information.

Initial investigations conducted by community groups were unable to determine the reasons for this discrepancy in evaporation losses. Moreover, community groups were unable to obtain any information or details on what data BIGMOD estimations were being modelled on, or how these models were being developed. However, the efforts of community groups did unveil some interesting issues which require further consideration and investigation, including the following:

- In a 2004 report, the CSIRO reported that "the lack of data for calibrating and running BIGMOD means that modeled data for flow at Lock 1 and evaporation rates are almost 500ML/d too high." (Lamontagne et al, 2004) Thus, Australia's preeminent scientific body has questioned the results produced by BIGMOD, and has indeed challenged the very basis of its use to estimate evaporation;
- The DWLBC stated that river losses from the South Australian border to the Locks at Goolwa were apportioned based on area of water, above and below Lock 1, with no allowance for differing evaporation rates (and Pan Coefficients), local catchment inflows or incident rainfall;
- The only recent piece of research carried out on the Water Balance of Lake Alexandrina, where actual data was collected and analysed, was that of Vincent Kotwicki over the period 1990 to 1992 (Kotwicki, 1993).

With this in mind, the members of the Lower Murray Drought Reference Group: Recovery subcommittee decided to consider other methods for deriving estimates of evaporation from Lake Alexandrina and Lake Albert and also to estimate the net loss after evaporation of the Lower Lakes as a water catchment. The research conducted by Vincent Kotwicki is instructive on this point, and will now be discussed.

In his PhD thesis, "Evaporation from Lake Alexandrina", Vincent Kotwicki lists 35 different methods to estimate evaporation. He remarks that some methods require complex instrumentation while others can be considerably simpler. He argues that it "should be realised that the cost and complexity of the apparatus involved is in no way a guide to the reality of the measurement it produces" (Kotwicki, 1993, p23).

It is considered that one of the best methods to estimate the evaporation from the lake surface would be to position fully instrumented automatic weather stations over the lake surface. Such an approach makes use of micrometeorology and turbulence theory to estimate the water loss from the surfaces of the Lower Lakes. There are many other methods, however, this requires recorded data from the area to have been collected for a number of years, and this would need to be an ongoing process. Unfortunately this has not been the case.

For many years evaporation from a Class A pan was measured at Milang. Unfortunately at the start of arguably the most interesting period in the Lower Lakes' history, during the late 1990s, most evaporation measurements were discontinued. Evaporation data available to the Bureau of Meteorology includes data collected from Milang (1968 to 1998), Wellington (1969 to 1998), Pelican Point (1968 to 1987) and Mundoo Island (2003 to 2007). However, it must be noted that much of the data from Mundoo Island is incomplete. The importance of complete data collection cannot be stressed highly enough.

Due to the lack of continuous data available from the Bureau of Meteorology, this Paper has utilised SILO data available for the relevant period. SILO is a database maintained by the Queensland Department of Natural Resources and Water, from where an historical climate series, including rainfall and evaporation, is able to be generated. SILO data for the 37 year study period of 1970 to 2006 was selected as this was the period for which most data existed. Fortunately it also included the extremely wet year of 1992 and the extremely dry year of 2006.

Water Balance

This Paper argues that the most effective way to measure water losses is to use the Water Balance approach. The Water Balance approach is used to determine water losses in restricted water bodies, such as Lake Alexandrina and Lake Albert, usually over a longer averaging period. While it is true that few Water Balance experiments have been undertaken, this Paper argues that it will provide good guidance in this case.

The Water Balance approach represents the change in storage as:

$$\Delta S = P + I + U - O - E$$

Where ΔS is the change in storage volume, P is the amount of precipitation, I is the surface inflow, U is the groundwater throughflow, O is outflow and E is the evaporation of a particular body of water.

The precipitation (P), can be estimated data collected from reporting stations around the Lakes. The area is relatively flat and the variation in the rainfall pattern due to orography should be slight. Therefore, it was assumed that the rain gauges provide reasonable indication as to the actual rainfall.

The surface inflow to the lake (I), includes runoff only from the streams in the Eastern Mount Lofty Ranges ('EMLR'), excluding the contribution of the River Murray. Very little stream gauging is undertaken in the EMLR, with readings from Yundi on the Finnis River spanning the longest period. Estimates of stream flow provided indicate that the median annual contribution from the EMLR is approximately 114.5GL. This is the DWLBC median modelled estimate for the period 1970 to 2006.

The groundwater throughflow (U) is unknown and long term records of this flow do not exist. Barnett is quoted as suggesting groundwater inflow to be of the order of 250 m³ per day, which is insignificant in the overall Water Balance.

Surface outflow (O), can be estimated by the volume of flow over barrages, and for the purposes of this investigation, it is assumed that the surface outflow is zero.

The evaporation (E) is the volume of water lost to evaporation.

Thus the simplified Water Balance equation now becomes:

$$\Delta S = P + I - E$$

Data Sources and Manipulation

Rainfall

The Bureau of Meteorology has rainfall stations situated at many locations around the Lakes. A significant number of these stations have been reporting for many years, many approaching 100 years of records. The Bureau of Meteorology uses a 30 year average as its standard period for rainfall.

There are no rainfall gauging stations located inside the lake perimeter. The surrounding terrain is generally flat and it is unlikely there would be any terrain induced rainfall variation in the area.

In an attempt to make use of as long a record as possible, a SILO data set for a location near Milang was used. This gave a median value of 402mm. For the period 1970 to 1998 the median rainfall for Milang #24558 was 363mm, and for Milang #24519 was 416mm.

The average of all rainfall sites around the lake gives a median value of 406mm.

Evaporation

Evaporation is estimated using a Class A evaporation pan. Put simply the evaporation is measured as the water loss from a 1.2 metre diameter galvanised water trough, approximately 300mm deep, as illustrated in Figure 1. Class A pans have been used for much of the past 40 years. A problem experienced with Class A pans is that in very arid areas, birds and animals would drink from this trough. To overcome this, a guard

consisting of a cover of approximately 12mm mesh was installed. This has been estimated to lead to a reduction of the measured evaporation of about 7% when compared to readings taken from a pan without a guard.



Figure 1 Class A Evaporation Pan

SILO data for Milang, consisting of rainfall and evaporation data for the period 1970 to 2007, has been used in an attempt to extend the length of the data set. While actual rainfall data is available from the Bureau of Meteorology for the period 1970 to 2008, evaporation data is not always available over the same period. This is due to Milang, Wellington and Pelican Point evaporation sites all ceasing operation.

The median annual evaporation from the SILO dataset for a point near Milang was 1544mm. Median annual Class A pan evaporation values were 1489mm at Milang, 1475mm at Wellington and 1655mm at Pelican Point. An estimate of the Class A pan evaporation for the Lower Lakes would simply be the average of these median evaporation estimates, or 1543mm.

Local Catchment Inflow

In the estimation of the local catchment inflow (I), rainfall run-off data captured by the DWLBC from a site on the Finniss River near Yundi has been used. This is not a measure of actual flows into the Lower Lakes, but records flows considerably upstream from them. In order to provide an estimate of inflow into the Lakes it has been assumed that this catchment is relatively representative of the other catchments. Using the median inflow of 114.5GL (modelled by DLWBC for the period 1970-1998) into the Lower Lakes over all catchments, estimates of inflow into the Lakes were produced for the study period 1970 to 2006. The estimation procedure is attached as Appendix 1.

It is noted that the Marne Rodwell Rivers do not discharge directly into the Lower Lakes but into the Murray River below Lock 1. These account for about 10 per cent of the total.

For comparison, using a different methodology, also presented in Appendix 1, the derived catchment inflows are confirmed to be of around the same order.

Table 1 Comparison of methodologies

Year	Estimates of catchment inflow		Difference
	Method used	Check method	
1997	50	58	-8
1998	53	67	-14
1999	48	64	-16
2000	169	155	+14
2001	118	137	-19
2002	27	36	-9
2003	106	104	+2
2004	96	81	+15
2005	95	96	-1
2006	31	36	-5

There is some discussion as to whether the geology and hydrology of all catchments are sufficiently similar to allow for this premise, however this has been used failing any other available data.

As the median inflow of 114.5GL was modelled over the period 1970 to 1998, there may be some discussion as to whether it is appropriate to extrapolate to the 1999 to 2006 period of this study. However, any differences are thought to be marginal and would not detract from the main tenets of this study. Any difference in magnitude would be in the order of tens of gigalitres or less.

Pan Coefficient

To better estimate evaporation from the Lake Alexandrina and Lake Albert, the following equation was used:

$$E_{\text{lake}} = K_p * E_{\text{pan}}$$

Where E_{lake} is the evaporation from Lake Alexandrina and Lake Albert

E_{pan} is the evaporation pan reading

K_p is the Pan Coefficient

Linacre argues that the pan coefficient is on average about 0.75, which implies there is 30% more evaporation from the small area of a pan than from a lake due to the extra heat absorbed through the pan wall. Linacre claims that the pan coefficient is not constant but varies. The rate of evaporation may well be around 0.75 at 5mm a day and may decrease to around 0.58 when the pan evaporation increases to around 12 mm a day. Linacre also contends that evaporation from a salty lake is reduced by the salt

concentration, because the saturation vapour pressure over salt water is less than over fresh.

Kotwicki investigated evaporation on Lake Alexandrina and Lake Albert and found that for the years 1990 to 1992 the pan coefficient averaged 0.67. Kotwicki found that the microclimate across the lake changes with the area towards the centre of the lake having a higher relative humidity than that nearer the edge. His airborne measurements showed that relatively more evaporation occurs from the edges of the lake than from the centre. Therefore a K_p value of 0.67 was chosen.

Other studies claim that the coefficient is a function of temperature with values around 0.9 when the temperature was near 10°C and values near 0.6 when the temperature was closer to 40°C.

This study will present annual figures, from January to December, over the period 1970 to 2006. The average rainfall in column 2 of the following table, Table 2, is an average for the Lakes. This depth of rain is multiplied by the surface area of the Lake at a pool level of 0.75AHD, in Column 3. In a similar manner the evaporation for the Lake is estimated and then multiplied by the evaporating surface, again at a surface area consistent with a pool level of 0.75AHD. Catchment inflows are derived from the DWLBC modelling as described above, and the final column is the Lakes' storage loss for the year.

Table 2 Results: Water Balance for Lake Alexandrina and Lake Albert

	Rain (mm)	Rain (GL)	Evap (mm)	Evap (GL)	Catchment Loss (GL)	Loss (GL)
1970	463.8	380.4	1615.8	-887.9	112.0	-395.5
1971	466.1	382.3	1600.4	-879.4	261.5	-235.6
1972	388.1	318.3	1721.8	-946.1	51.4	-576.5
1973	404.1	331.4	1674.8	-920.3	140.5	-448.4
1974	596.8	489.5	1544.4	-848.6	174.8	-184.4
1975	385.0	315.8	1620.8	-890.6	122.7	-452.2
1976	370.4	303.8	1655.0	-909.4	50.7	-554.9
1977	356.3	292.2	1710.2	-939.8	56.5	-591.1
1978	468.5	384.2	1573.2	-864.5	131.0	-349.2
1979	500.8	410.7	1539.8	-846.1	155.0	-280.4
1980	385.8	316.4	1751.2	-962.3	38.0	-607.9
1981	401.4	329.2	1706.0	-937.4	206.5	-401.8
1982	248.8	204.1	1695.4	-931.6	20.1	-707.5
1983	531.9	436.2	1534.4	-843.2	104.8	-302.1
1984	384.2	315.1	1533.6	-842.7	114.5	-413.1
1985	475.4	389.9	1481.0	-813.8	88.7	-335.2
1986	402.2	329.9	1550.2	-851.8	216.6	-305.4
1987	418.9	343.6	1557.0	-855.6	184.8	-327.2
1988	333.7	273.7	1550.6	-852.1	129.9	-448.5
1989	443.4	363.7	1537.4	-844.8	146.7	-334.4
1990	425.6	349.1	1553.6	-853.7	156.1	-348.5
1991	371.8	304.9	1513.4	-831.6	128.3	-398.4
1992	695.5	570.4	1295.4	-711.8	248.7	107.3
1993	409.4	335.8	1478.2	-812.3	83.6	-392.9
1994	345.2	283.1	1514.4	-832.2	25.8	-523.3
1995	337.7	277.0	1472.8	-809.3	144.8	-387.5
1996	380.8	312.3	1539.8	-846.1	163.5	-370.3
1997	376.1	308.5	1474.6	-810.3	49.6	-452.3
1998	431.9	354.2	1513.2	-831.5	53.0	-424.2
1999	359.0	294.4	1575.0	-865.5	47.8	-523.2
2000	504.7	413.9	1597.6	-877.9	168.9	-295.0
2001	404.3	331.6	1512.8	-831.3	118.4	-381.3
2002	289.8	237.7	1572.0	-863.8	26.7	-599.5
2003	481.0	394.5	1498.6	-823.5	106.2	-322.7
2004	378.7	310.6	1543.8	-848.3	95.8	-441.9
2005	515.8	423.0	1466.2	-805.7	94.5	-288.1
2006	288.8	236.9	1558.6	-856.5	31.1	-588.5

The median loss from the Lower Lakes pool for this period has been calculated as 396GL. Given the errors in measurement, this estimate should be approximated as 400GL of net water loss for the Lakes.

The usefulness of the SILO data for this monitoring purpose and trying to estimate the net water loss from the Lower Lakes was investigated. From the data below, it can be seen there is a strong correlation when there is data at Milang. Net water loss from the lakes using local rainfall and evaporation data is 384GL. For the period since 1999 it is impossible to determine how good the correlation actually is.

Lake levels during early August 2008 were approximately -0.3AHD, which is 1.05m below the normal pool level of 0.75AHD at which the surface area of the lakes is 820.15 sq km. The estimated surface area at -0.3AHD is 709.71 sq km. At this reduced lake level the surface area over which evaporation can take place has therefore been reduced by 13.5% and therefore the evaporation from the lake surface will be reduced by an equivalent amount.

Table 3 Evaporation Comparison

	Net Loss using SILO data (GL)	Net loss using Actual Rainfall and Evaporation data(GL)
1970	-395.5	-411
1971	-235.6	-215
1972	-576.5	-531
1973	-448.4	-396
1974	-184.4	-178
1975	-452.2	-413
1976	-554.9	-545
1977	-591.1	-565
1978	-349.2	-355
1979	-280.4	-276
1980	-607.9	-557
1981	-401.8	-337
1982	-707.5	-657
1983	-302.1	-282
1984	-413.1	-363
1985	-335.2	-328
1986	-305.4	-284
1987	-327.2	-336
1988	-448.5	-450
1989	-334.4	-326
1990	-348.5	-381
1991	-398.4	-409
1992	107.3	67
1993	-392.9	-421
1994	-523.3	-565
1995	-387.5	-384
1996	-370.3	-365
1997	-452.3	-416

1998	-424.2	-472
1999	-523.2	N/A
2000	-295.0	N/A
2001	-381.3	N/A
2002	-599.5	N/A
2003	-322.7	N/A
2004	-441.9	N/A
2005	-288.1	N/A
2006	-608.6	N/A

References

Kotwicki V, *Evaporation from Lake Alexandrina. School of Earth Sciences*, PhD thesis, Flinders University of South Australia, 1994

Kotwicki V, 'The Nature of Evaporation from Lake Alexandrina', *Water Down Under 94: Surface Hydrology and Water Resource Papers* (Barton ACT, Institution of Engineers) (ISBN 0858256215) available online at:
<http://search.informit.com.au/documentSummary?dn=75219382346780:res=IELENG>>

Lamontagne S, McEwan K, Webster I, Ford P, Leaney F, Walker G, *Coorong, Lower Lakes and Murray Mouth: Knowledge gaps and knowledge needs for delivering better ecological outcomes* Water for a Healthy Country National Research Flagship, CSIRO Canberra (ISBN 0 643 091 556)

Linacre E, *Ratio of lake to pan evaporation rates*, available online at <http://www-das.uwo.edu/~geerts/cwx/notes/chap04/eoep.html>

Acknowledgements

We would like to thank the members of the Lower Murray Drought Reference Group: Recovery subcommittee for their suggestions.

We would also like to thank Professor Peter Schwerdtfeger, Emeritus Professor of Meteorology at the Flinders University of South Australia for his support.

Appendix 1: Estimation of Catchment inflows.

DWLBC	Surface	Water	Archive	HYANN	V59	Output	18/02/2008
Site	A4260504	FINNISS RIVER @ 4Km East Of Yundi					
Variable	151	Stream Discharge Volume in Megalitres,					
Year	Annual	Days	Rank	Estimated end flow all catchment from Finniss Ranked Sheet			
	Total (Megalitres)	Missing					4.6356
						ML	GL
1969	10210	65	33	47330	Disregard too many days missing		
1970	24160		20	111996.8			112
1971	56420		1	261542.1			262
1972	11080	6	29	51362.8			51
1973	30300		13	140459.5			140
1974	37710	27	6	174809.5			175
1975	26460		17	122658.7			123
1976	10940		30	50713.8			51
1977	12180		27	56461.9			56
1978	28260		14	131002.8			131
1979	33440		10	155015.4			155
1980	8193		34	37979.7			38
1981	44540		4	206470.9			206
1982	4337		38	20104.7			20
1983	22610		22	104811.5			105
1984	24700		19	114500.0			115
1985	19130		25	88679.6			89
1986	46720		3	216576.5			217
1987	39860		5	184776.1			185
1988	28020		15	129890.3			130
1989	31650		11	146717.6			147
1990	33680		9	156127.9			156
1991	27670		16	128267.8			128
1992	53660		2	248747.8			249
1993	18040		26	83626.7			84
1994	5561		37	25778.7			26
1995	31240		12	144817.0			145
1996	35280		8	163544.9			164
1997	10690		31	49554.9			50
1998	11440		28	53031.6			53
1999	10320		32	47839.7			48
2000	36440		7	168922.3			169
2001	25550		18	118440.3			118
2002	5755		36	26678.0			27
2003	22920		21	106248.6			106
2004	20670		23	95818.4			96
2005	20390		24	94520.4			95
2006	6710		35	31105.1			31
2007	2775	196	39	12863.9	Disregard too many days missing		
Total	29700	294					
Minimum	2775						
Maximum	56420						
Mean	23840						
Median	24160						

Appendix 1: Catchment Inflows

Finniss flow close to Yundi									
Year	Annual Flow	Days Missing	Ranking						
1971	56420		1						
1992	53660		2						
1986	46720		3						
1981	44540		4				Top 10% say		
1987	39860		5				Using factor highest 10 % is	184.78	
1974	37710	27	6						
2000	36440		7						
1996	35280		8						
1990	33680		9						
1979	33440		10						
1989	31650		11						
1995	31240		12						
1973	30300		13						
1978	28260		14						
1988	28020		15						
1991	27670		16						
1975	26460		17						
2001	25550		18						
1984	24700		19				Say median is 1984 (18th of 36)		
1970	24160		20				If 114.5gl is median on whole catchment flow		
2003	22920		21				Then factor is $114.5/24.7 =$	4.6356	
1983	22610		22						
2004	20670		23						
2005	20390		24						
1985	19130		25						
1993	18040		26						
1977	12180		27						
1998	11440		28						
1972	11080	6	29						
1976	10940		30						
1997	10690		31						
1999	10320		32						
1969	10210	65	33						
1980	8193		34						
2006	6710		35				Bottom 10% say		
2002	5755		36				Using factor lowest 10% is	31.06	
1994	5561		37						
1982	4337		38						
2007	2775	196	39						

Appendix 1: Catchment Inflows

Lower Murray River						
Estimate of Eastern Flowing Streams of the Mt Lofty Ranges connecting to the Murray River.						
All flows are Annual						
	Current Flow					
System	Mean (ML)	Median (ML)				
Burra	-	-				
Marne	3,528	2,616	}	}	10%	Marne & Eastern Hills
Eastern Hills	12,420	9,210				
Bremer	25,807	22,317	}	49,807	Total inflow % from these 4 rivers	44%
Angas	18,113	15,664				
Finniss	44,452	45,704	}	64,216	The Finniss alone contributes	40%
Tookayarta	11,647	11,410				
Currency	7,249	7,102				
Total of Eastern Flowing Streams	123,217	114,023		114,023		

APPENDIX 2: Excerpt of related topics from draft Information Sheet

What is the Natural Water Balance of the lakes system?

A water balance measures the difference between input and output flows from the system.

The components of the Natural Water Balance for the Lower Lakes, include: rainfall and inflows from the local catchments (Finniss River, Currency Creek, Tookayerta, Bremer River, Angas River and Marne-Rodwell River) and local lake shore groundwater and surface flows (which are hard to quantify and therefore not included in figures below) and losses due to evaporation.

An estimate of the Natural Water Balance (before considering River flow into the lakes or from the lakes over the barrages or consumptive use) carried out for the period 1970 to 2006 by investigators independent of government, but using government supplied data, has arrived at the figures below for the Water Balance of the Lower Lakes:

All quantities in GL	Median Year	Best Year (1992)	Worst Year (1982)
Rainfall	Na	570	204
+ Catchment Inflow	Na	249	20
+ Lake shore surface run-off	Na	Unknown	Unknown
+ net groundwater inflows	Na	Unknown	Unknown
- Evaporation	Na	711	932
Water Balance	-396 GL	+107	-707

Essentially this means that River Murray flow into the lower lakes (before any extractions and without any flow out of the lakes over the Barrages) needs, in a median year, to be in the order of 396 GL in order to maintain the Pool Level of the lakes

Analysis of the same period indicates the following median values: Rainfall inflows-330GL (range 204 to 570GL), Local Catchment Inflows-114GL (range, 20 to 262), Evaporative Losses-852GL (range 962 to 711).

Note that:

- these figures are based at a Lake level of 0.75 AHD and that at lower lake levels the water balance is more responsive to catchment and rainfall inflows. At current low lake levels (with a reduced lake surface area): evaporation from the lakes is less while rainfall and catchment inflow remain about the same, meaning that the Natural Water Balance (to maintain existing level) of the lakes improve. This means we can expect lake levels to rise by than normal if we have normal winter inflows. Using the same climate data as in the table above but starting at a lake

- AHD of -0.5M, where the surface area is 677.87 sq km we get the following results: Natural Water Balance median -247 GL(ranging from +231 to -546)
- catchment inflows have been modelled from median inflows of 114GL. It has been suggested that median inflow could be as little as 40GL per annum which would reduce catchment inflow for 1992 to 88GL and 2006 to 11GL. If this is the case then Water Balance for 1992 and 2006 would be -53GL and -609GL respectively. Anecdotal evidence tends to confirm that 1992 catchment flows were of a very high magnitude.
 - Net groundwater inflow or outflow from the lakes has not been determined, some researchers say that it is likely to be insignificant and others possibly not, due to high water tables about the lake.
 - Lake shore run off has also not been quantified but again some researchers indicate it could be significant.

To get an operating water balance (Complete Water Balance) for the lakes, River flows in and out of the lakes as well as extractions (consumptive uses such as irrigation, stock and domestic use, etc) from the lakes would need to be considered.

Is this Natural Water Balance Data and approach agreed by all?

No, DWLBC using BIGMOD (the only independently audited and accredited daily flow and salinity routing model: developed for the MDBC) prefer to use the term System Losses or Evaporation and Losses. On this basis DWLBC say that Lakes average loss is 750GL (compared with the 396GL median loss calculated by the Natural Water Balance as discussed above) and the river from Lock 1 to Wellington is about a 100GL loss.

System Losses are calculated from:

Flow into SA – flow over Barrages –consumptive uses = System Loss

System Loss is then apportioned between above and below lock1 based on surface area of water.

What is the difference between Water Balance and Evaporation?

Evaporation is just one of the components of the Water Balance. It is misleading to quote evaporation losses alone without considering all other components of the Natural Water Balance which in most years considerably reduce the net quantity of water lost from the lakes.

What is E_{pan} ?

The standard way to daily measure of the amount of evaporations is measure the depth/height of water lost from an internationally recognised 'A Class evaporation pan'; a metal pan 1.2metres in diameter and 0.3 metre deep and adjust the reading for any precipitation that may have occurred since the last reading.

Why is E_{pan} reduced by a coefficient to work out actual evaporation and why does it vary?

While the evaporation pan is a standard way to make the measurement, it doesn't directly measure the amount of water evaporating from the surface of say Lake Alexandrina or say a green lawn. A raft of factors have been determined to adjust raw

E pan measurement to provide a better estimation of the evaporation that is actually occurring off that particular surface. These factors are called Pan Coefficients . The Pan Coefficient for a lake is generally reported in the Literature to be in the order of 0.7 Vincent Kotwicki in 1992 found that the Pan Coefficient for Lake Alexandrina over the years 1990 to 1992 was 0.67.

Epan measurement x Pan Coefficient = Estimated Evaporation

How much water evaporates from the Lower Murray and Lakes?

At pool level (0.75 AHD) and over the period 1968 to 2006 estimated evaporation varied between 711GL and 962 GL per annum with a median of 852GL from the lakes and about 125 GL per year from the river channel below Lock 1. To demonstrate the importance of Lake level (and therefore lake area) at the current level of approximately 0.5AHD evaporation over the same period of time, would range between 588 and 795GL with a median value of 704GL. A considerable reduction in evaporation than occurs at Pool Level.

DRAFT

Murray-Darling Basin Commission

Options for Water Savings from the Lower Lakes for improved flows in the Coorong and through the Murray Mouth

Report prepared by the
**Environmental Flows and Water Quality Objectives
for the River Murray Project Board**

November 2001

MDBC Technical Report 2001/11

*For consideration at
Murray-Darling Basin Commission Meeting 62 – 11 December 2001*

Executive Summary

In August 2001, the High Level Steering Group on the Lower Lakes requested that the Murray-Darling Basin Commission (MDBC) prepare this report on the options for water savings from the Lower Lakes.

The Lower Lakes are located on the River Murray in South Australia and are separated from the Murray Mouth and the Southern Ocean by a line of Barrages. They have a surface area of 81,500 ha and evaporate 745 GL per year on average.

This report analyses the benefits of four options for saving water in the lakes by reducing evaporation. The conclusions of this analysis are:

- A reduction in the target operating level of the Lower Lakes from 0.75 to 0.55 m AHD would save 30 GL/year by reducing the surface area of the lakes by 4% to 78,000 ha.
- Removal of the Barrages would reduce the average level in the Lower Lakes by approximately 0.5 metre. This would save 60 GL/year by reducing the average surface area by 9% to 74,000 ha.
- The construction of a bund within Lake Alexandrina to divide the lake into fresh and saline compartments would not reduce evaporation from the lakes since the inner lake would still evaporate. Because the water to replenish this evaporation would be drawn from inside the Mouth and because the water level in the fresh compartment would be more stable, the net flow out of the Mouth would be 10 GL/year less under this option.
- A weir at Wellington would maintain water levels in the River Murray between Wellington and Lock 1. It would not in itself save water but would be required if the Barrages were removed and may be desirable if the lake level is lowered.
- The ballpark cost of:
 - a Weir at Wellington is \$100 million,
 - a bund in Lake Alexandrina is \$270 million
 - Relocating the supply or compensating water uses around the lakes ranges between \$10-\$100 million.
- Lowering the level in the Lower Lakes would adversely affect navigation, marinas, boat ramps and jetties and would expose areas of mud flat. This would have a substantial impact on recreation, boating and tourism. However, it would have environmental benefits such as increased wader habitat.
- Lowering the lake level would reduce erosion and consequently decrease lake turbidity, improving water quality
- Both the Barrage removal and bund construction options would result in an increase in the tidal flows in and out of the Mouth. Whether this would result in an increase or decrease in the build up of sand inside the Murray Mouth would need to be examined using the morphological model being developed for the MDBC.

- Both the Barrage removal and bund construction options would result in substantial changes to the habitat in the Lower Lakes and substantial changes to the freshwater and estuarine fisheries.
- Any changes to the Coorong habitat would trigger Ramsar obligations and an international assessment of each modelling scenario may be necessary.

EXECUTIVE SUMMARY	2
1. INTRODUCTION.....	5
1.1 THIS REPORT	5
1.2 HISTORIC LAKE AND RIVER MOUTH CONDITIONS.....	7
1.3 EXTERNAL CONSTRAINTS ON OPTIONS	7
2. MODELLING SCENARIOS	8
2.1 OPTION 1 – REDUCE THE LOWER LAKE OPERATING LEVEL TO 0.55 M AHD	8
2.1.1 SOCIO-ECONOMIC IMPACTS	8
2.1.2 ENVIRONMENTAL IMPACTS	9
2.2 OPTION 2 – REDUCE THE LOWER LAKE OPERATING LEVEL TO 0.55 M AHD AND CONSTRUCT A WEIR AT WELLINGTON TO MAINTAIN RIVER LEVELS	11
2.2.1 SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACTS.....	11
2.3 OPTION 3 – REMOVE BARRAGES AND CONSTRUCT A WEIR AT WELLINGTON.....	11
2.3.1 SOCIO-ECONOMIC IMPACTS	11
2.3.2 ENVIRONMENTAL IMPACTS	12
2.4 OPTION 4 – CONSTRUCTION OF A BUND IN LAKE ALEXANDRINA TO ISOLATE A FRESH ANNULUS FROM A 50 000 HA SALINE INNER LAKE.....	12
2.4.1 SOCIO-ECONOMIC IMPACTS	13
2.4.2 ENVIRONMENTAL IMPACTS	14
3. CONCLUSIONS.....	15
4. REFERENCES	17

1. Introduction

1.1 This Report

This report explores a number of lake management options for reducing evaporation from the Lower Lakes, so that the resulting water savings are available to enhance the environment of the Murray Mouth and Coorong.

Lakes Alexandrina and Albert are located on the River Murray in South Australia just upstream of the Murray Mouth as shown in Figure 1. A line of Barrages, inside the mouth, separates the fresh water in the lakes from the saline water in the Coorong and the Murray estuary. The lakes have a surface area of 81,500 ha and currently evaporate an average of 745 GL/year.

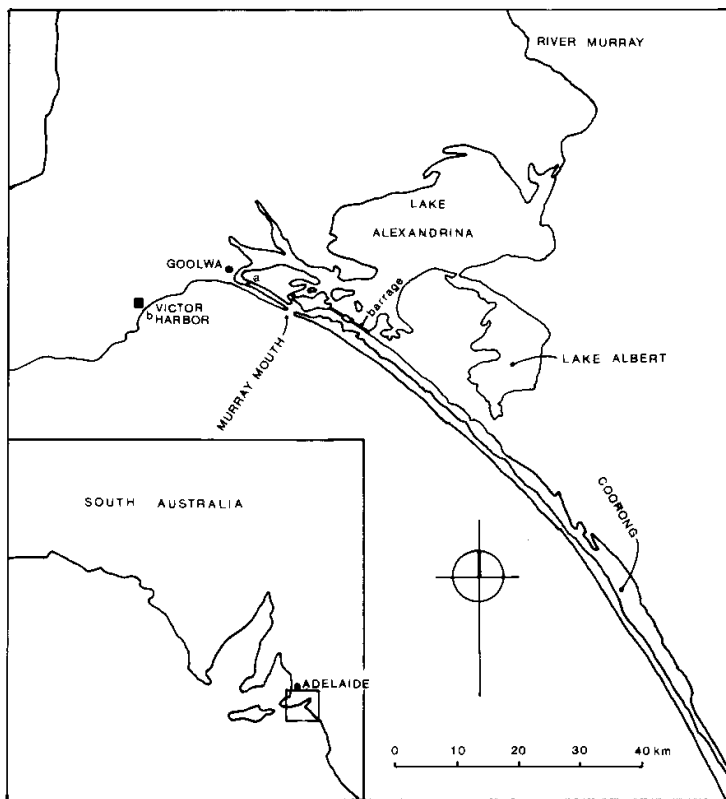


Figure 1. Location of the Lower Lakes

Flow into the lakes has been reduced by upstream development over the last 130 years. Currently the median annual flow over the Barrages is only 27% of the median natural flow as is shown in Table 1.

Reduced flows have resulted in the Mouth becoming increasingly constricted with a build-up of sand limiting tidal exchange in the estuary.

The primary concern regarding potential closure of the River Mouth is the impact that this would have on the ecology of the Coorong, a unique coastal estuarine lagoon system and part of a Ramsar registered wetland. Although the River Mouth has only

closed once in recorded history, it has been severely constricted for most of the past 4 years and there is evidence of a significant decline in the ecological health of the Coorong and the fish and bird populations that depend on it.

Table 1. Comparison of natural and current flow conditions

	Flow over Barrages (GL/yr)		
	Natural Conditions	Current Conditions	Current/Natural %
Mean Annual Flow	12896	5071	39%
Median Annual Flow	11318	3092	27%

It has long been suggested that changing the way the lakes are managed could generate significant savings from lake evaporation. The water savings could then be put either to increased consumptive diversions or to increased flows through the river Mouth potentially reducing the build-up of sand.

Currently the nominal operating level for the Lower Lakes is 0.75 m AHD although the actual operating level varies between 0.65 and 0.85 m AHD. Analysis using the Murray-Darling Basin Commission (MDBC) model indicates that the probability of there being no flow from the river into the lakes is very rare, occurring in only two months in the 109 year simulation during a period when South Australia's entitlement flow was restricted. However, there will be many months when the evaporation from the lakes will exceed the lake inflows. On these occasions the Barrages will be closed and the lake level will drop. In 1968 the lake level fell to 0.1 m AHD. The increase in South Australia's entitlement in 1979 reduced the size and frequency of lake drawdowns; however the lakes are still drawn below the target level about 30% of the time. The minimum expected lake level under current conditions is 0.25 m AHD. A sample of the simulated lake levels from the benchmark run which assumes that South Australia's diversions have increased up to the Cap level is plotted in Figure 2.

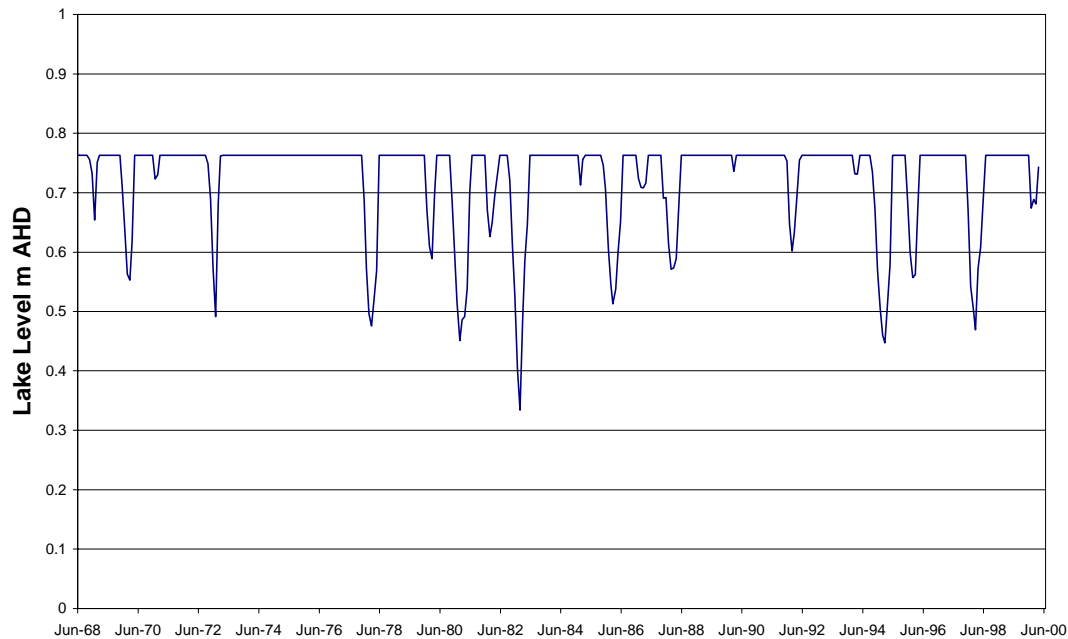


Figure 2. Modelled Water Levels in Lake Alexandrina from the Benchmark Run

1.2 Historic Lake and River Mouth Conditions

Under natural flow conditions, prior to the implementation of regulation and diversions throughout the Murray-Darling Basin, Lakes Alexandrina and Albert were predominantly fresh water lakes, only becoming brackish or saline at times of low river flow. It is evident from the original fringing vegetation, the ecology of the lakes and the fact that irrigation and domestic water supplies were being drawn from the lakes, that there were no substantial concerns about salinity in the lakes until upstream irrigation demands began to increase. Effectively the natural river flow negated the tidal influence throughout this area at most times.

It is also evident from photographs and historical accounts of the river and the lakes that the normal water level was dominated by freshwater flows and was substantially higher than would be expected if the level was dictated by tides alone. The higher natural flows would have been sufficient to back the water levels up to the current levels in many years. As a consequence the lake evaporation before the Barrages were built was not substantially less than that under current conditions.

1.3 External Constraints on Options

When assessing options for obtaining evaporation savings, the impacts on the following factors need to be considered:

1. Water levels in the Lower Lakes for:
 - (a) social and recreational needs;
 - (b) access to water supplies for current irrigation and stock and domestic users;
 - (c) environmental needs/outcomes;
2. Water levels in the River Murray upstream of Wellington to allow:

- (a) pumping for the major urban off-takes;
 - (b) gravity irrigation of the reclaimed swamps;
3. The risk of closure of the Murray Mouth;
 4. The Ramsar values of the Lower Lakes, Coorong and Murray Mouth area;
 5. Acceptable water quality in the Lower Lakes (eg salinity and algal numbers) for the intended use of the water;
 6. The environmental and salinity benefits of the current flows through the South Australian section of the River Murray upstream of Wellington; and
 7. The risk of flooding.

2. Modelling Scenarios

River Murray water can be saved by reducing the average surface area of freshwater in the Lower Lakes. Four options for reducing the evaporation from the Lower Lakes have been analysed for this paper and their impacts on water savings, lake levels, salinity and river flows at the Mouth have been assessed using the MDBC models.

2.1 Option 1 – Reduce the Lower Lake operating level to 0.55 m AHD

The current lake operating level averages 0.76 m AHD. This option lowers that level to 0.55 m AHD. The surface area of the Lower Lakes would reduce from approximately 81 500 ha to 78 000 ha (Lakes Alexandrina and Lake Albert combined) or a 4% reduction. The hydrologic impacts of the options are summarised in Table 2. The estimated water savings generated by reducing the lake surface area would be approximately 30 GL. Levels in the Lower Lakes and in the River Murray upstream of Wellington would fall by about 0.2 m. This change would not require any modification to the Barrages.

2.1.1 Socio-economic impacts

The pump offtakes for the 199 private irrigation waters and for several small community water supplies around the lakes would need to be extended as a consequence of lowered lake levels. The cost for the extension of pipes will depend on the number, pipe diameter and how far into the lake the existing pipes would have to be extended. Further investigation into the irrigation cost of lowering lake levels is necessary, but these costs are likely to be relatively small. For many of the landholders adjacent to the lakeshore these costs could be offset by the reduced rate of land erosion.

Water levels from Wellington to Lock 1 (Blanchetown) are influenced by lake level variations. A lowered lake level would have implications on reclaimed swamp irrigators upstream of Wellington. The installation of pumps for gravity fed offtakes in this reach would be necessary whenever lake levels decrease below 0.55 m AHD.

The impacts of lake lowering on recreation and tourism would be significant. Boating, navigation and other activities would be significantly affected near Goolwa, some lakeshore areas or where existing channels are shallow. Information on the impact on existing marinas, boat ramps, jetties and access levels is needed if this option is to be pursued.

Small town (eg Narrung) water supply systems that are drawn from the lakes are still likely to be able to draw water effectively from the lakes but some additional pumping costs would be incurred.

Reductions in lake levels would result in a more stable lakeshore and increased environmental values. Therefore, a long-term improvement in tourism in the region could be expected. The fishing industry would be boosted by an improvement in water quality and ecosystem habitats.

2.1.2 Environmental Impacts

Adopting a lower lake level would reduce shoreline erosion. However, the variability of lake levels would have to be increased at this lower level to generate significant environmental benefits. Simply lowering the existing lake levels without introducing a degree of variability would provide very little environmental benefit. This may in turn reduce the volume of water savings over time. A reduction in erosion is achieved by promoting the dissipation of wave energy on lakeshore sands rather than terrestrial soils and to avoid the wave action and waterlogging of the highly dispersive Poltalloch soils. Detailed analysis is required to determine the optimum lake level for erosion control purposes but indications are only a modest reduction would deliver significant benefits. For example, a reduction in pool level of 0.25 m would most likely provide significant benefits in terms of reducing the exposure of the lakeshore to frequent, highly erosive forces. Smaller reductions of 0.15 m would benefit some areas but may still result in exposure of the Poltalloch soils to frequent wetting and wave action. The current management practice of surcharging the lake before summer to ensure lake levels can be maintained near pool level by the end of summer exacerbates the issue of an artificially high lake level.

A reduction in erosion would reduce the turbidity of the lakes and improve the water quality encouraging the growth of aquatic vegetation and supporting fish species. The samphire-Melaleuca swamp and edge communities inhabiting the lakeshores would be at less risk of inundation, thus increasing opportunities for lakeshore revegetation. Freshwater wetland habitat would increase providing drought and summer refuges for migratory birds and lakeshore waders. Any changes to the Coorong habitat would trigger Ramsar obligations and an international assessment of each modelling scenario may be necessary.

Salinity levels may rise due to increased saline groundwater inflows as lake levels are lowered. However, this requires further investigation.

This option would increase flow out of the Mouth by 30 GL/year which is a 0.6% increase over current outflows. By itself this is unlikely to reduce the risk of Mouth closure. However, combined with savings in other parts of the River, 30GL/year would contribute to a more comprehensive environmental flow program proving more beneficial to the Murray Mouth.

Table 2. Summary of the Analysis of the Options for Water Savings in the Lower Lakes

	B57550	B57540	B57530	B58530	B57650	B57580	B58400
	Natural Conditions Run for Lower Lakes Study 25/9/01	1993/94 Reference Run for Lower Lakes Study 25/9/01	Benchmark Run for Lower Lakes Study 25/9/01	Barrages held at 0.55 m AHD	Wellington Weir - Barrages held at 0.55 m AHD	Wellington Weir - Barrages Removed	50000 ha Bund in Lake Alexandrina
	Absolute	Absolute	Absolute	Difference from Benchmark Run			
Wellington							
Flow into Lower Lakes (mean GL/year)	13581	5898	5857	0	0	-41	0
% of months with Flow Reversal at Wellington	0.38	0.08	0.15	0.00	0.00	0.00	-0.08
% of months Wellington Level < 0.75 m AHD	100.0	27.2	30.7	68.7	-30.6	-30.6	-27.4
Wellington Level (mean m AHD)	0.20	0.73	0.72	-0.21	0.05	0.05	0.04
Lower Lakes							
Lower Lakes Level (mean m AHD)	0.20	0.73	0.72	-0.21	-0.21	-0.51	0.04
Lower Lakes Level (minimum m AHD)	0.06	0.09	0.25	-0.20	-0.23	-0.19	0.04
Lower Lakes Level, % months < 0.6 m (all months)	100.0	7.2	12.5	87.0	87.0	87.5	-12.3
Flow over barrages (median GL/year)	11318	3041	3092	35	36	123	550
Flow over barrages (mean GL/year)	12896	5115	5071	30	31	60	447
Net Flow out of Mouth (mean GL/year)	12684	4903	4859	30	30	60	-9
Flow over barrages % years (& longest gap in years)							
- > 7,000 ML/d 2 consec. mths Sep-Dec (fish recruitment)	98 (1)	61 (4)	61 (4)	0 (0)	0 (0)	1 (0)	3 (0)
- > 10,000 ML/d 3 consec. mths Sep-Dec (fish recruitment)	96 (1)	39 (11)	39 (11)	0 (0)	0 (0)	3 (0)	3 (0)
Water Quality							
Wellington Salinity (ave level in EC)		633	631	1	0	21	1
Lake Alexandrina Salinity (ave level in EC)		861	854	3	3	2191	81
Lake Albert Salinity (ave level in EC)		1834	1808	-30	-30	4028	213

2.2 Option 2 – Reduce the Lower Lake operating level to 0.55 m AHD and construct a weir at Wellington to maintain river levels

This option is similar to Option 1 except that a weir is constructed at Wellington to maintain the river upstream of Wellington to Lock 1 at the current or higher pool level. As with Option 1, the area of the lakes would be reduced from approximately 81 500 ha to 78 000 ha (4%) and the estimated savings in evaporation would be 30 GL/ year. The ballpark estimate of the cost for the construction of a weir at Wellington is \$100 million, however this is an approximate figure that is greatly dependent on further investigations..

2.2.1 Socio-economic and Environmental Impacts

These impacts would be similar to those discussed under Option 1. The difference would be that no further action would be required to maintain the supplies to the gravity irrigators or to the major urban pump offtakes on the River between Wellington and Lock 1.

2.3 Option 3 – Remove Barrages and construct a weir at Wellington

This scenario proposes that the existing Barrages would either be removed or simply left open (ie, gates/stop logs removed) with causeways left intact. A weir would be required at Wellington to maintain the supply of fresh water upstream to Lock 1 (Blanchetown) for irrigators and major urban water supply offtakes. The 199 irrigators around the lakes with an annual diversion between 45 and 52GL/year are supplied from this weir pool.

The lakes would return to an estuarine condition. Lake levels would be determined by a combination of sea level/tidal and River flow influences. The average surface area of the lakes would reduce from 81 500 ha to 74 000 ha (9%). This option would reduce evaporation from the Lower Lakes by 60 GL/year.

Salinity across the lakes would vary from freshwater during flood flows to seawater during extended periods of low flow.

As stated (with qualifications) the ballpark estimated cost for construction of the weir at Wellington is \$100 million. The cost of relocating the water supply to the current irrigators around the lakes would be in the range of \$10 to \$100 million. If this option is to be pursued, more work is required to clarify the estimated costs.

2.3.1 Socio-economic Impacts

With a return to estuarine conditions, lakeshore irrigation would have to either cease (presumably with purchase or compensation) or irrigators would have to be given access to the weir pool above Wellington weir (again, with compensation). The costs incurred with these options require further investigation to provide an accurate estimate. In addition, the same options apply to small town offtakes from the Lower Lakes due to the decreasing water quality of the lakes for consumptive use. It is

estimated that the compensation or resupply of all lake water users would be in the range of \$10 to \$100 million.

Removal of the Barrages would subject the lakes to tidal influence and would reduce the average lake level by around 0.5 m. Boating navigation and other activities would be significantly affected near Goolwa, some lakeshore areas or where existing channels are shallow. There would also be considerable impact on existing marinas, boat ramps and jetties and the area of mud flats would increase. The impacts of lake lowering on recreation and tourism would be substantial.

A change to the fishing industry would occur with a reduction in freshwater. However, further investigation would be required to determine whether this would be a negative or positive impact due to the increase in estuarine conditions favouring particular fish species.

2.3.2 Environmental Impacts

Lake salinity levels would rise due to the ingress of seawater with the tides and to replace evaporation in the lakes during periods of low inflow from the River. There may also be increased saline groundwater inflows as lake levels are lowered. However, this requires further investigation.

The Lower Lakes would return to more estuarine conditions with removal of the Barrages and installation of a weir at Wellington. A change to fish, bird and fauna habitat would be a consequence of a return to estuarine conditions. Lower Lake levels would reduce erosion around the lakeshores and this, in conjunction with the increased salinity, is likely to reduce lake turbidity. This may encourage aquatic vegetation.

Removing the Barrages would increase net flow out of the Mouth by 60 GL/year which is a 1.2% increase over current outflows. This increase in the net flow out of the Mouth will result in a slightly reduced risk of Mouth closure although, by itself, it is unlikely to make a major impact. Combined with savings in other parts of the River, however, 60GL/year would contribute to a more comprehensive environmental flow program proving beneficial to the Murray Mouth.

The removal of the Barrages would increase the tidal prism and hence the volume of water flowing in and out of the Mouth during the tidal cycle. In addition, evaporation from the lakes during those months when evaporation exceeds inflow from the River would draw an average of 60 GL/year of water into the lakes from the sea. This volume would be flushed out again once the inflows from the river increased. The impact of these changes on the risk of Mouth closure is not well understood. The MDBC has engaged a consultant to develop a morphological model of the Murray Mouth which is expected to shed light on this question. However, there is a belief that increasing the inflows from the sea may increase the volume of sand deposited inside the Mouth.

2.4 Option 4 – Construction of a bund in Lake Alexandrina to isolate a freshwater annulus from a 50 000 ha saline inner lake

This option aims to physically divide the lakes into freshwater and saline water compartments. There are several possible variations on the theme, including bunds or embankments in Lake Alexandrina, Lake Albert or both. The bund could either be a continuous structure leaving an annulus of freshwater around the perimeter of the lake(s) or a structure which isolates a portion of the lake by joining with the land at two points. The bund could be constructed of a variety of materials and would have an estimated total construction cost of \$270 million.

The option examined for this report was the construction of an embankment in Lake Alexandrina running parallel to the shore. This embankment separates the fresh river water from a saline inner lake contained within the bund. The fresh water flows around the outside of the lake before eventually entering the Murray estuary and the Coorong through the existing Goolwa, Mundoo, Boundary Creek and Tauwitcherie Barrages. The inner lake is connected to the Murray Estuary and the Coorong through a separate channel between these Barrages. This connection is inside the Mouth. As modelled, the inner lake has a surface area of 50 000 ha compared to the existing surface area of Lake Alexandrina of 63 500 ha. The surface area and volume of the lake upstream of the Barrages is reduced and this enables the level in the outer lakes and the river to be regulated more closely to pool level. It also increases the flow over the Barrages into the Murray estuary by 447 GL/year on average.

However, the water inside the inner lake will continue to evaporate and water will be drawn from the Murray Estuary which is inside the Murray Mouth. All of the additional flow over the Barrages is used to balance evaporation in the inner lake. The analysis of this proposal suggests that, although the flow over the Barrages increases by 447 GL, the net outflow from the Mouth reduces by 10 GL.

The maintenance of the Murray Mouth has been recognised as a key objective for environmental management in the Murray-Darling Basin. The bund proposal, although nominally saving evaporation of fresh water, does not reduce overall evaporation from the Lower Lakes and does not increase flow out of the Mouth. Therefore, from the viewpoint of Mouth closure, no savings have been achieved and no water has been generated. . If further irrigation development occurred along the River as a consequence of this option, net outflows from the Mouth would reduce, breaching the Murray-Darling Basin Ministerial Council's Cap on diversions.

2.4.1 Socio-economic Impacts

A bund in the Lower Lakes has socio-economic impacts in the Lower Lakes, Coorong and Murray Mouth region due to extensive alterations to the lake environment.

The construction of a rock-lined embankment visible from all locations on Lake Alexandrina would be an unnatural intrusion into a unique landscape and this may affect tourism and recreation in the region.

The presence of a bund would hinder movement around the Lower Lakes, thereby impacting on recreational activities ie. boat navigation, fishing, and water skiing. Consequently, the economically significant tourism/ecotourism industry in the region could be affected.

Freshwater fish habitat would decrease with a reduction in lake area damaging a significant South Australian industry. Currently, the freshwater fishing industry in the Lower Lakes generates approximately \$1.1 million per year (770 tonnes for 1999/2000 financial year) for the economy, and any impact on this industry must be viewed with extreme caution. This may be balanced to a degree by an increase in the estuarine fishery.

The presence of indigenous cultural artefacts requires consideration. Aboriginal historic sites, burial grounds and relics may be impacted with the implementation of this option.

2.4.2 Environmental Impacts

The construction of a bund in Lake Alexandrina would reduce the net flow out of the Mouth by 10 GL/year or 0.2%. This reduction is unlikely to have a significant impact on the risk of Mouth closure, however, given the impact that the reduction in flows has already made to the silting of the Mouth, it is a move in the wrong direction.

The connection of the inner lake to the Murray Estuary will increase the tidal prism and hence the volume of water flowing in and out of the Mouth during the tidal cycle. The impact of this change on the risk of Mouth closure is not well understood. However, there is a belief that increasing the inflows from the sea may increase the volume of sand deposited inside the Mouth. If this is the case, siltation would also cause problems for the maintenance of the inlet channel to the inner lake.

The greater degree of lake level regulation that is possible with the bund option could result in more stable and, on average, higher lake levels. As a consequence, lakeshore scouring and erosion is likely to increase leading to greater water turbidity and a decline in aquatic vegetation.

Evaporation from the inner lake would result in a net inflow into that lake. Since the lake would no longer be flushed during high River flows, the exchange of water with the tides and winds is unlikely to be sufficient to prevent the salinity of the inner lake rising steadily over time. This process may also lead to the concentration of other undesirable water quality parameters with consequential impacts on the environment.

A reduction in the freshwater area of the lake would impact on fish habitat decreasing freshwater fish species. The compensating increase in the area of estuarine habitat may depend on how saline the inner lake eventually becomes.

A reduced area of either Lake Alexandrina or Albert would restrict the mixing of water between the two lakes via wind. Lake Albert is naturally more saline than Lake Alexandrina. Wind generated water mixing ensures that Lake Albert is occasionally

freshened with less saline Lake Alexandrina water, especially when flood flows are present. The possible impact of reduced wind mixing of the lakes has not been included in the modelling of Lake Albert salinity.

3. Conclusions

Four Options for saving water from the lower lakes to increase flow out of the Murray Mouth have been examined. The conclusions reached for these four options are summarised below and in Table 3.

3.1 Option 1. - Lower Lake Level to 0.55 m AHD

- Evaporation reduced by 30 GL/year;
- Works required to lower water offtake infrastructure around the Lower Lakes and the River Murray between Wellington and Lock 1;
- Lake and River levels drop by 0.2 metres on average;
- Significant impact on recreation, boating and tourism expected; and
- Reduced erosion around lakes and subsequent environmental benefits.

3.2 Option 2 - Lower Lake Level to 0.55 m AHD and Build Wellington Weir

- Same as Option 1 except that water levels in the River between Wellington and Lock 1 are stabilised at the pool level
- Estimated \$100 million cost for new weir

3.3 Option 3 – Remove Barrages and Build Wellington Weir

- Evaporation reduced by 60 GL/year;
- Works required to relocate water supply for existing water users around lakes at cost of \$10 - \$100 million;
- Estimated \$100 million cost for new weir;
- Reduced operation and maintenance costs for Barrages;
- Lake levels drop by 0.5 metres on average
- Substantial impact on recreation, boating and tourism expected;
- Reduced erosion around lakes and subsequent environmental benefits;
- Increased tidal prism may or may not increase siltation at the Murray Mouth;
- Salinity in the lakes would vary from freshwater during flood flows to seawater during extended periods of low flow;
- Substantial changes to the habitat in the Lower Lakes; and
- Substantial changes to the freshwater and estuarine fisheries.

3.4 Option 4 – Construction of a bund in Lake Alexandrina to isolate a fresh annulus from a 50 000 ha saline inner lake

- 10 GL increase in evaporation from lakes;
- Estimated \$270 million construction cost

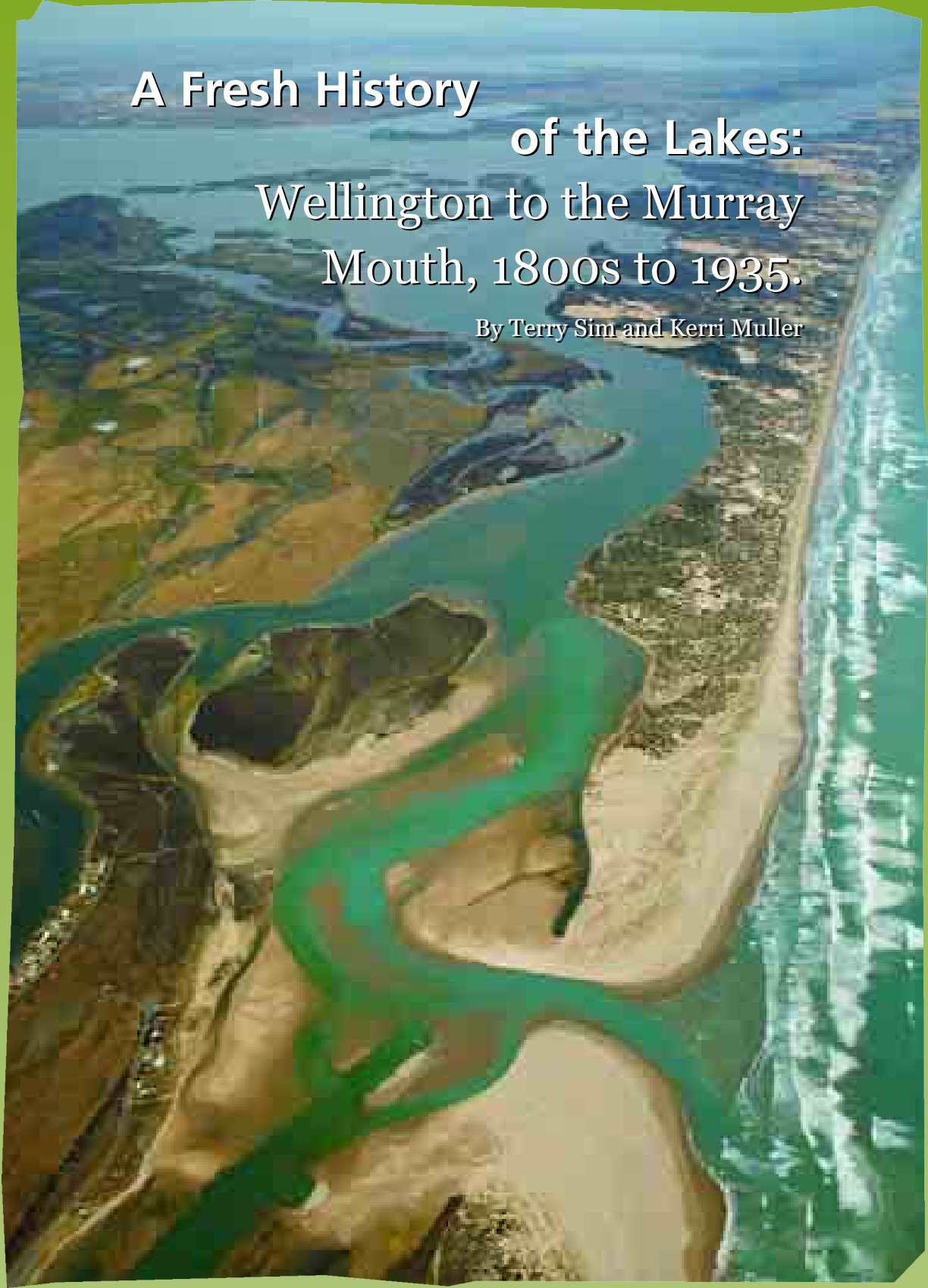
- More stable water levels in the outer lake and in the River Murray between Wellington and Lock 1;
- Increased tidal prism may or may not increase siltation at the Murray Mouth;
- Slightly increased erosion around lakes and subsequent adverse environmental impacts;
- Without flushing, the salinity of the inner lake would increase over time;
- The bund would be an unnatural intrusion in a unique landscape;
- The bund would hinder boat movement around the Lower Lakes,
- The freshwater fish habitat would decrease but, provided that the inner lake does not become too saline, this may be balanced by an increase in the estuarine fishery; and
- Increased salinity in Lakes Alexandrina and Albert.

Table 3 – Summary of Options

Scenario	Construction Cost	Generated water Savings Net flow out of Mouth (mean GL/year)	Operation & maintenance expenses	Salinity Impacts Lake Alexandrina (ave level in EC)	Salinity Impacts Lake Albert (ave level in EC)	Lower Lake Levels (mean m AHD)	Net flow out of Mouth (GL/year)
Current Operation (Benchmark)	0	0	\$850 000 / year (current)	854	1808	0.72	4859
Lowered Lake levels (0.55m AHD)	Cost of lowering offtakes around lake and lower River	30 GL	\$850 000 / year (current)	857	1778	0.51	4889
Lowered Lake levels (0.55m AHD) with Wellington Weir	\$100 million Plus cost of lowering pump offtakes around lake	30 GL	\$850 000/ year (as above) plus operation and maintenance on Wellington Weir \$320 000/year.	857	1778	0.51	4889
Barrages Removed with Wellington Weir	\$100 million plus \$10-\$100 Million to move supply to lakes	60 GL	\$320 000/ year Plus reduced operating costs of Barrages and supply to existing lakes irrigators	3045 ⁺	5836 ⁺	0.21	4919
Bund Option	\$270 million	-10 GL	\$850 000 / year (current) plus bund and lake operation and maintenance	935	2021 ⁺	0.76	4850

4. References

1. ID&A (2001), *The impact of a weir at Wellington (with and without the existing Barrages) on water savings and on water levels in the Lower Lakes*, MDBC Project 2017, September 2001.
2. ID&A (2001), *Lower Murray Environmental Scoping Study*, MDBC Project R10017, April 2001.
3. ID&A (2001), *Lakeshore erosion control around the Lower Murray Lakes, South Australia*, Job No. 5500511, prepared for Coorong District Local Action Plan Committee, Goolwa to Wellington Local Action Planning Board Inc., Point Sturt and Districts Landcare Group, and the Department for Environment and Heritage, May 2001.
4. Close A.F. and Bradshaw P.L. (1983), *River Murray water Resources Planning Study – Phase 1. The Murkey Computer Model*, Engineering and Water Supply Department Library Reference 83/46, September 1983.
5. Ebsary R.M. (1983), *Lake Albert Salinity Study*, Engineering and Water Supply Department Library Reference 82/62, South Australia, May 1983.
6. Kinnaird Hill deRohan and Young PTY LTD (1979), *Lower Lakes Study - Stage 1 Report*, prepared for EWS Department, South Australia, October 1979.



**A Fresh History
of the Lakes:
Wellington to the Murray
Mouth, 1800s to 1935.**

By Terry Sim and Kerri Muller



© River Murray Catchment Water Management Board, 2004.
This document is the property of the River Murray Catchment Water Management Board which holds the copyright in it and the possession of this document or the copying thereof without the express consent of the River Murray Catchment Water Management Board is not permitted. If marked 'Confidential' this copy should be returned to the River Murray Catchment Water Management Board and the reasonable cost of doing so will be refunded.

For further information contact:

*River Murray Catchment Water Management Board
PO Box 4
STRATHALBYN SA 5255
ph: 08 8536 8125
fax: 08 8536 8126*

*River Murray Catchment Water Management Board
PO Box 1374 BERRI SA 5343
Phone: 08 8582 4477
www.rivermurray.sa.gov.au*

*Contact Author:
Mr Terry Sim
PO Box 35 MILANG SA 5256*

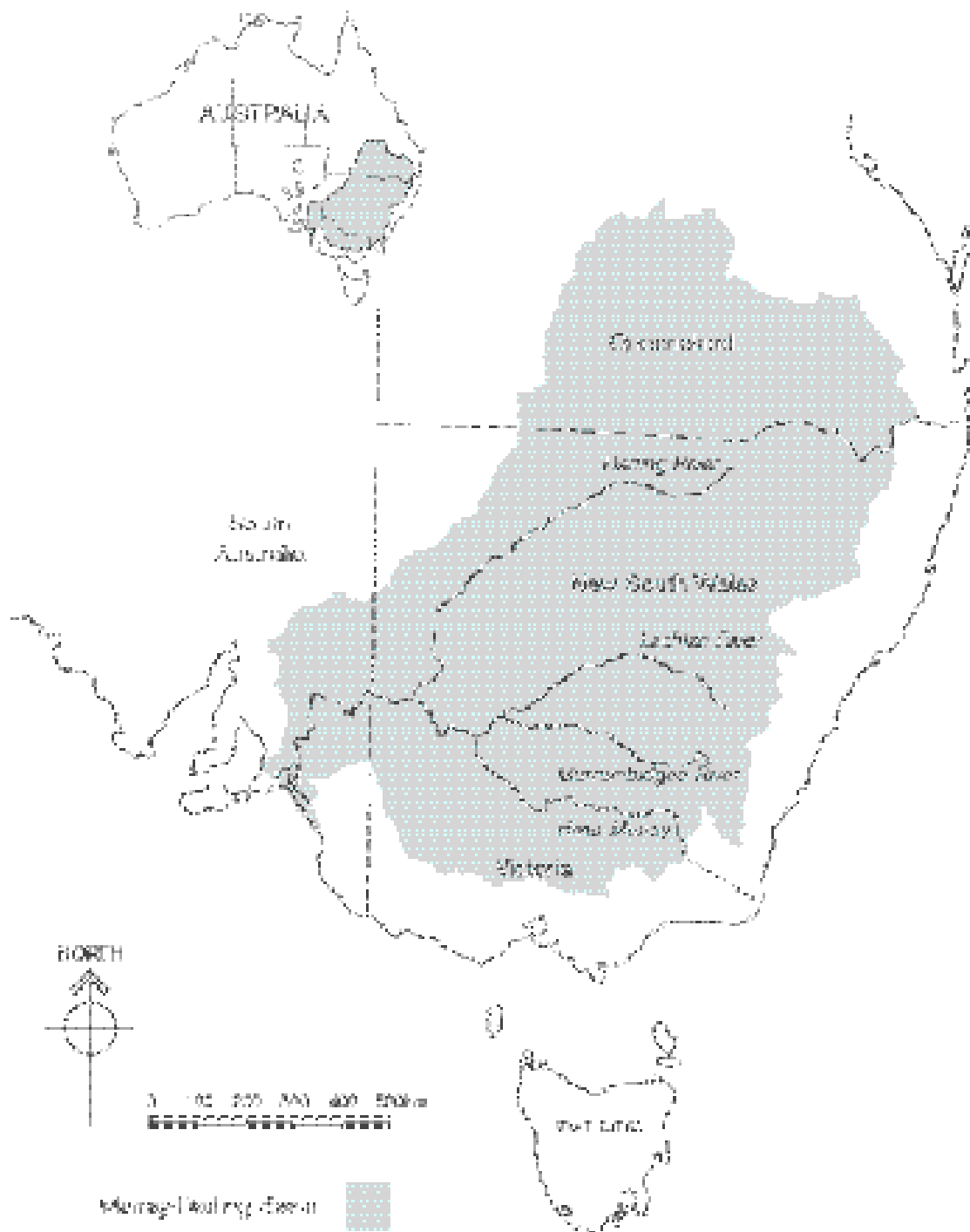
*Cover photos copyright the Murray-Darling Basin Commission.
Photographer Michael Bell*

Contents

1	Introduction	1
2	Summary of events	9
3	European settlement caused change	21



Murray Mouth (2004)



Introduction

1. Introduction

Prior to European settlement, Lakes Alexandrina and Albert at the terminus of the River Murray were predominately fresh, with river water discharging to sea and keeping the Mouth clear. Contrary to what many believe today, saltwater intrusions into the Lake environment were not common until after 1900 when significant water resource development had occurred in the River Murray system.

Before large-scale extractions of water, the Lakes and lower Murray were rarely subjected to seawater invasions. Long time Goolwa resident Edward Leslie Goode told an enquiry in 1933 *'I can remember when it was a remarkable thing when saltwater came up to the Goolwa wharf. Now we see saltwater in the lakes for months'*.

Short-lived intrusions of saltwater would occur during periods of low flow down river resulting in a lowered level of water in the lakes. Even in times of these low flows, it would appear that only small areas of the Lakes (immediately around the Murray Mouth and into the channels towards Point Sturt for a short distance) were affected. Winds could blow salt water into the main body of Lake Alexandrina for short periods but when the wind ceased to blow, the flow of water downstream pushed the saline water back out of the Mouth.

This is illustrated by the following statement from the Mount Barker Courier, (sourced from a 1903 report and quoted in a 1928 item regarding the barrages) and saying in part that barrages were necessary for *'the prevention of an inrush of salt water between the islands, and so into the lakes, whenever the wind blows from the south'*.

Saline invasions were more common after 1900 and the development of irrigation works because reduced river flows could not hold back the sea. Irrigation schemes began at the same time as a long lasting, widespread drought that further diminished the amount of water in the river system.

'Through the joint influences of long continued drought and an increasing diversion of its waters in its upper course, the River Murray has steadily lowered its levels so that its lower reaches and the lakes which for centuries it had supplied with a constant flow of fresh water, have fallen to sea level, with the result that instead of the river "rushing out to sea" the tides of the ocean have flowed in, changing the fresh water lakes to salt ones.' Southern Argus, 1903.

The settlers around the Lakes, who were reliant on a supply of fresh water from the Lakes, began to agitate for their *'Riparian Rights'* to be restored. Mr Hacket, chairman of the Meningie District Council said in 1902 *'it was only too plain that the land was decreasing in value owing to the growing saltiness of the water. The land had been purchased from the Government at high figures owing to the beautiful fresh water frontage which it then possessed'*.

The replacement of freshwater by saltwater was also bemoaned by the Superintendent of the Point McLeay Mission, Mr F Garnet in 1902. He said that *'when the lakes were fresh there was considerable feed actually in the water, in the shape of waterweeds, but instead of being a source of food supply for the stock that now has become a nuisance and a disaster. It is rotting and smells badly and contaminates the air and water.'*

Another loss to the mission is that the fish have been driven out of the lakes by the salting of the water’.

Garnett also said that ‘Despite the long drought the waters of the lakes have always been sweet at this time of the year, and more or less through the hot weather so that their present condition is quite phenomenal. To the mission the salty condition of the lakes is a most serious matter, as apart from the above mentioned difficulty it has completely stopped the washing of wool on the mission. Woolwashing for the sheep stations in the neighbourhood has for many years found for about twenty natives steady and remunerative employment for two or three months every summer, the industry being quite self supporting. Its destruction means a loss of 200 pound per year to the natives’.

With the lack of fresh water in the Lakes, an alternative source for stock and domestic supplies needed to be found. *‘A few years ago it would have been considered a sheer waste of money for anyone living at the Lakes to have put down artesian bores to secure a supply of freshwater, but, unfortunately owing to the usurpation of the waters of the Murray by Victoria and New South Wales for irrigation purposes, the flow of freshwater into the lower reaches of Australia’s greatest waterway has not for some considerable time past been nearly sufficient to prevent the influx of sea waters through the Murray Mouth into the Lakes. Consequently, where previously there was an unlimited supply of beautifully fresh water, fit for almost any purpose, there is now only salt water, and stock-owners and agriculturists are forced to bore for supplies of freshwater to meet their requirements’.* (*Boring for Water at Milang, Mount Barker Courier* November 1902).

In addition to the desire of maintaining the freshwater condition of the Lakes for agricultural and domestic purposes, a push was also occurring in South Australia to keep enough water in the river to allow riverboats to ply it. South Australia was seen as the natural outlet, via the Murray, for the produce of three States. To enable this trade to prosper and grow, the level of water required to allow these boats to traverse it had to be maintained. Therefore in the initial stages of the fight to maintain a fresh supply in the Lakes for agricultural purposes, the need of enough water to enable regular navigation up and down the river was coupled with it.

A Fresh History of the Lakes: Wellington to the Murray Mouth 1800s to 1935 details and illustrates the conditions found from when colonisation of South Australia began in 1836 until changes to the quality and quantity of water began in the 1880’s. It shows that extractions of water from the system upstream in New South Wales, Victoria and South Australia, along with drought conditions, caused change to the Lakes. The conditions experienced by landholders, river traders and the many who made use of the waters of the Lakes before those alterations is illustrated.

The ‘fight’ that resulted to keep the Lakes fresh by those who had an interest in them is shown. This ‘fight’ commenced in the late 1880’s and continued until the building of the barrages, which were started in the 1930’s returned freshwater to the system.

There were many plans, schemes and ideas suggested to control and regulate the area of the Murray Mouth from the 1840’s until the construction of those barrages in the 1930’s. Initially the works were seen as ways to harness the flow down the Murray to make it more navigable, such as suggested by Sturt in 1842 to direct all the flow through the Goolwa channel. It was hoped that a constant flow of water through the mouth would make it safer for boats to pass through.

Later plans were devised to retain freshwater in the Lakes instead of letting it flow to 'waste' out to sea. Then as conditions in the river and Lakes changed the schemes were designed to prevent seawater from entering into the Lakes system and maintain a freshwater reservoir.

What finally resulted were the five barrages, Goolwa, Mundoo, Boundary Creek, Ewe Island and Tauwichee that are in place today.

This document, through information sourced from articles in newspapers, Parliamentary debates, diaries, journals, reports, letters, family and local histories and surveyor's notes records the events that shaped the history of the Lakes from the 1820's, when the first Europeans visited, until construction of the barrages returned it to a freshwater environment in the 1930's.

THE RIVER MURRAY SYSTEM*

The Murray is an ancient river, with a history spanning many million years, from the time Australia split from the giant super continent of Gondwanaland and began its slow northward drift.

Over those millions of years, the River has undergone profound changes. Much of the present river valley was once covered by a warm shallow sea, with the surrounding land supporting rainforests and rivers discharging huge volumes of water.

As the Australian continent drifted slowly northwards the climate became increasingly arid. In southern Australia lush rainforest was replaced by vegetation able to survive long periods without rain and the flow of the river systems decreased. Following the most recent retreat of the sea the ancestral River Murray discharged into a huge terminal lake, "Lake Bungunnia" which persisted from about two million years ago until about 500,000 years ago when the Lake Bungunnia drained to give the present course of the River through South Australia to the sea.

In its 2,500 kilometre course from the Eastern Highlands to the Southern Ocean, the River Murray traverses the following five distinct regions.

THE HEADWATERS, from its source in the Snowy Mountains to Corowa, a distance of about 450 river kilometres. The Headwaters comprise less than 2% of the Murray-Darling Basin, but contribute nearly 40% of the inflow to the River.

THE RIVERINE PLAINS, a vast, flat tract of river and lake deposits where the river flows in shallow, branching channels, from Corowa 800 river kilometres to the Wakool River junction, just west of Swan Hill.

THE MALLEE TRENCH, a wide plain of marine origin crossed by the River in a single, well-defined channel which cuts deeper into the surrounding plain as it moves downstream. The Mallee is broadly defined by the Murravian Gulf, marking the extent to which the sea once encroached across the river valley. The Mallee Trench extends from the Wakool junction (New South Wales) 850 river kilometres down to Overland Corner (South Australia).

* adapted from the Murray Darling Basin Commission's 'The Murray' in part

THE MALLEE GORGE, here the River has cut down through hard limestone rock during a period of low sea level, forming steep cliffs along the river channel. The riverbed intersects the regional watertable allowing groundwater to enter the River through aquifers exposed in the cliff face. The Mallee Gorge covers a river distance of about 280 kilometres, from Overland Corner.

LAKES ALEXANDRINA, ALBERT AND THE COORONG

The terminal lakes, Lakes Alexandrina and Albert together with the Coorong form a huge shallow system. Lakes Alexandrina and Albert cover over 75,000 hectares.

The valley of the ancestral Murray has been partially filled by the rising post-glacial sea forming Lakes Alexandrina and Albert. The southern edges of the two lakes are defined by sandy ridges swept up by the rising sea and by onshore winds. The same process formed the Coorong. This is an impressive strip of water, 160 kms long and less than 3 kms wide, extending south along the coast from Lake Alexandrina. This, too, is separated from the sea by a thin barrier of calcarenite-cemented sands swept by the rising sea.

The final exit of the Murray's waters into the Southern Ocean is probably the most variable element of the entire Murray system and the unreliable and treacherous nature of mouth has always limited its value as an inland transport route.

Under natural conditions, flow out of the Murray Mouth was greater than 2,000 Megalitres per day ninety five percent of the time and geo-morphological studies suggest that the Mouth did not close for at least 8,000 years.

In 1981, the Mouth closed completely for the first time and within 24 hours sand deposits at the Mouth were higher than the 1956 flood level (the largest flood in the River since European settlement). This suggests that Mouth closure is not a natural event as (a) historical Mouth closure would be readily seen in the geo-morphological record if it had occurred and (b) even the 1956 flood levels would not have cleared the Mouth once it closed in 1981.

This is consistent with changes in the fishing industry from a thriving Murray Cod (freshwater) fishery in the 1800's to a salt water fishery by the 1930's.

*Murray Mouth
(2004)*





NGARRINDJERI AND THE LAKES

Lakes Alexandrina and Albert along with the channels near the Murray Mouth are part of the Ngarrindjeri Aboriginal lands. Ngarrindjeri lands extend from Cape Jervis to Kingston and up river as high as Murray Bridge.

The Ngarrindjeri nation is made up of several clans, each with ownership of defined portions of the larger area. The area was very productive and supported one of the largest populations of people in southern Australia before European occupation. However, prior to European colonisation of South Australia at least two epidemics (probably smallpox) swept down the River Murray from the colony of New South Wales. The effect this had on the local people was devastating and it is estimated that a great many died as a result.

The Ngarrindjeri were not a nomadic people prior to European colonisation but occupied permanent settlements or villages and had a network of defined pathways between these villages. Researchers Berndt, Berndt and Stanton in their 1993 work '*A World That Was. The Yaraldi of the Murray River and Lakes, South Australia*' explain that the Ngarrindjeri lived in '*a residential group more or less permanently settled, with ample food supplies within easy reach. It is true that clan members did hunt and collect food at some distance from their home camps, had hunting rights in adjacent clan territories, and even had their winter and summer camps. ...However, such mobility does not necessarily imply a semi-nomadic existence, since their home camps were more than mere base-camps.*'

Philip Clarke in his 1994 thesis '*Contact, Conflict and Regeneration, Aboriginal Cultural Geography of the Lower Murray of South Australia*' notes that there were at least 127 different items that the Ngarrindjeri utilised as food. He also points out that they smoked meat and fish, treated and stored vegetables and seeds as well as kept fish in impoundments all for later use.

The Ngarrindjeri have several traditional stories that mention or imply that the Lakes were fresh. For example Clarke's 1999 paper '*Waiyungari and his Relationship to the Aboriginal Mythology of the Lower Murray, South Australia*' contains the following information.

Regarding the leader Waiyungari, who lived at Rauwoke (the hill at Point McLeay), it is noted that '*Once while drinking water through a reed at Oulawar on the Lake, Nepeli's two wives saw him and fell in love with him*'. Waiyungari was '*also in the habit of going to Ngawulara (Ngulawar, Woodrow Point near Narrung) to drink and swim in Lake Alexandrina*'. This implies that the water in Lake Alexandrina was obviously fresh because it was used as a source of drinking water.

Clarke in the same paper says of another leader Nepeli, who had lost his two wives, that when he went to the Lake to secure his canoe he '*saw the flowering stem of pantaruki (ribbon weed, Triglochin procerum)*. This was a pretty plant that took his fancy, so he made a second wife out of that'. *Triglochin procerum* is a plant that only grows in a freshwater environment also implying that the Lake water was fresh.

Alison Harvey in 1943 recorded '*A Fishing Legend of the Jaralde Tribe, Lake Alexandrina, South Australia*' which tells of the travels from near Murrayville in Victoria to Point Sturt of a group of fishing men in the form of gulls, shags, divers, pelicans and others. They left their lagoon home at Murrayville because they had exhausted their food supply of fish.

Eventually they came to the locality of Tailem Bend where they halted '*because here and in Lake Alexandrina near by, the water was calm and fresh, an ideal fishing ground*'. Soon they had caught and landed a freshwater Murray Cod (*Maccullochella peeli*).

Moving on and after making reed nets, they fished at Nulawan a reedy flat on the shore of the lake (Sections 932 and 936 Hundred of Malcolm) where they caught Tjiri (Silver perch, *Bidyanus bidyanus*) and Tukkeri (Bony Bream, *Nematalosa erebi*), both freshwater species of fish.

The story continues with the group, after travelling to near the Murray Mouth, making their way to a rocky limestone cliff, Lindjeran, three mile south of Point Sturt (Section 18, Hundred of Alexandrina).

Harvey records that they fished in the freshwater here moving slowly around to the tall cliffs of Point Sturt, Manananal. It is at this location that the story reaches its conclusion of the men turning into the birds (gulls, shags, divers, pelicans and magpies) they represented.

Probably the best known Ngarrindjeri story is the creation of the River Murray and Lakes by Ngurunderi when he chased the giant cod Pondi (*Maccullochella peeli*, Murray Cod) a freshwater species. It was during the chase downriver that the twisting and turning of Pondi created the bends in the River and, finally at the end of the journey, the Lakes.

In Lake Alexandrina Ngurunderi cut Pondi into pieces, tossing each piece back into the water. As they fell into the water they became freshwater species of fish such as (Pomeri, *Tandanus tandanus*,) catfish, (Tarki, Pilarki, *Macquaria ambigua*,) Callop and (Tcheri, *Bidyanus bidyanus*,) Silver perch.

The plant and animal life that feature in the traditions of the Ngarrindjeri are freshwater species. This implies that the environment of Lakes Alexandrina and Albert was also fresh prior to European settlement.

EUROPEANS AND THE LAKES

Sealers from Kangaroo Island were the first European's to learn of Lakes Alexandrina and Albert in the early 1800's. Their existence was confirmed by Captain Charles Sturt (and party) on the first 'official' visit to the area in February 1830. He described Lake Alexandrina as a *'beautiful lake, which appeared to be a fitting reservoir for the noble stream that had led us to it; and which was now ruffled by a breeze that swept over it'*

Within 12 months of the Proclamation of South Australia (December 1836) the region of the Lakes Alexandrina and Albert was being examined with a view to settlement owing to its ready supply of freshwater.

Settlers ran cattle and sheep (from the early 1840's) along the Lake shores allowing the stock free access to the freshwater and feed. By the late 1840's the land had commenced being surveyed into Hundreds and Sections for closer settlement. Lake shore land was highly valued, and when the water quality began to decline in the 1900's there was much concern over provision of 'Riparian Rights' to water that people believed they had purchased with the lake-shore land.

Towns such as Clayton, Goolwa, Meningie and Milang were laid out on the shores of the Lakes from the early 1850's with a supply of freshwater readily available and upstream trade began using the River Murray as a 'highway'. South Australia quickly realised its strategic position with regard to transporting goods from eastern Murray Darling Basin States out to sea near Goolwa. Thus the need to provide water for transport was a major socio-economic issue when the river flows declined.

River flows and the need to provide water for irrigation began to become a political issue by the 1880's. Reduction in River flows were raised in the South Australian Parliament from 1878. In 1885, the colonies of New South Wales and Victoria signed an agreement to share the waters of the River Murray evenly between those two colonies without provision for the downstream use or needs of South Australia.

By 1887, there was great fears that extraction for irrigation would cause the lower River Murray to be impregnated with salt because river flows could no longer hold back the sea.

This major decline in flows lead to first the planning (from 1890) and then the construction of the barrages in the 1930's.



Reedbeds
(2004)

2. Summary of events

Sealers, whalers and inhabitants of Kangaroo Island tell of the existence of a freshwater lake on the mainland of South Australia

1820s

Sturt journeys down the river he named Murray and enters Lake Alexandrina, named by him after the Princess Alexandrina who later became Queen Victoria.

1830

Strangways and Hutchison travel upriver from near the Mouth to Point Sturt/ Point McLeay. *“water here was so pure that we filled our kegs”*

1837

Cock, Finlayson, Barton and Wyatt travel down the Bremer to Lake Alexandrina. *“The lake appears to be of vast extent, the waters being quite sweet and fresh”*

Sturt revisits looking for an alternative mouth. *“ During my late visit I never observed the sea running in, but a strong current always setting out of the channel”*

1838

Overlanders bringing stock from New South Wales arrive at the eastern shores of Lakes Albert and Alexandrina on way to Adelaide.

1839

Bonney *“came upon a point of the main lake, the water of which was perfectly fresh.”*

Hamilton, *“ There in the distance was the lake.... We were soon tasting the water – it was fresh, and it was not salt; it had a vapid sweet taste but it quenched our thirst”*

Expedition to Lake Alexandrina and River Murray by Governor Gawler, *“the waters of the lake were here perfectly fresh”*

1840

Police Commissioner O’Halloran visits looking for perpetrators of ‘Maria’ massacre. *“reeds that encircle Lake Albert in one continued belt along the whole of the shore seen by us”*

Surveyor General Frome and party of surveyors map whole of circumference of Lake Albert and all of Lake Alexandrina except from the Finniss to the Bremer rivers. Lake Albert, *“the waters we found in some parts very good in others slightly brackish”*

South Australia Company Manager, William Giles examines country in vicinity of Lakes Albert, Alexandrina and the Coorong for land suitable to establish runs on. The district he found to answer their expectations *“ and the water excellent. Water of good quality is also got by digging six to eight feet”*

1842

Sturt suggests building causeway from Hindmarsh Island to southern shore of lake diverting waters down Goolwa channel.

Cattle feeding on reeds (2004)



1843

South Australia Company set up sheep and cattle runs near Point Malcolm and Point McLeay. Dudley Melville, who lived in a hut at the present site of Raukkan, had problems with aborigines taking cattle *“when the cattle either went to water or returned from the lake they would select a young heifer and spear her”* This obviously frightened him because he also said *“when I had to go into the reeds for water I had a gun in one hand and the bucket in the other”*

1844

Rankine, Stirling, McLean, land holders in the Angas Special Survey at Strathalbyn have taken up land around Lake Alexandrina and lower Murray including Hindmarsh and Mundoo Islands.

Davenport from the Macclesfield Special Survey explained to his father that *“cattle are left quiet about the lake – have an abundance of good water in the spot (the reeds) where in summer their best feed lies”*

1850

Surveyor General Freeling and Collector of Customs Torrens make a survey. They note that Lake Alexandrina gives soundings of one and a half fathoms with plenty of room and *“water is occasionally brackish”*

1853

First paddle steamers commence on Lakes and River

1855

Surveyors in the Hundred of Alexandrina note that water in the lake is fresh.

1856

W Bennett Hays describes Murray Mouth.

Governor MacDonnell presented with a petition for improvement of Murray Mouth. Removal of rocky bar in Holmes Creek suggested.

1859

Taplin at Point McLeay, where there is around 400 people whose source of water is Lake Alexandrina, says that money is made from selling Murray Cod.

1867

At Wommeran, during a visit by the Duke of Edinburgh, the 400 aboriginals complained to Taplin that the officer in charge of the celebrations would not allow them to go to the lake for drinking water. Taplin said, *“ So I went and asked the officer who appeared to be in charge for leave to let the natives get a drink. He refused, and I got rather a rough reception from him. We marched our school children down to the lake”*

1868

Whilst carting a load of water, for domestic use, from the lake at Milang one of the casks tilted over and broke Mr McRae’s son’s leg.

Jetty at Narrows between Lakes Alexandrina and Albert 1870s



summary of events

A debate in House of Assembly passes resolution that *'It is desirable that a survey report of the Murray mouth should be made, to ascertain how far it can be made available for navigation, and also with a view to the construction of a canal between Lake Alexandrina and the sea together with an estimate of the cost'*

Marine Board carries out survey of Murray Mouth.

In a letter to the editor of the Southern Argus on some riverboat captain's reluctance to sail the waters of Lake Alexandrina the writer says, *"experienced skippers will laugh at such fearful dangers of the deep on an inland fresh water lake"*

1873

The Southern Argus describing Lake Alexandrina says, *"it is 12 miles from our town, and is a noble lake of fresh water. Goolwa being built at the extreme west end of Lake Alexandrina, where the river, after running through the lake, joins the sea"*

1875

Green water in Lake Alexandrina kills horses, horned cattle and sheep.

House of Assembly requests reports be obtained on the present state of the sandhills in the vicinity of the Murray Mouth.

1878

AH Landseer moved in the South Australian Parliament *'That in the opinion of this House measures should be taken forthwith for improving the navigation of the Lower Murray River'*.

1883

New South Wales and Victoria sign an agreement dividing waters of Murray.

1885

Premier of Victoria writes to Premier of South Australia suggesting that South Australia set up a Royal Commission of enquiry into the River Murray.

1886

During a debate in the South Australian Parliament regarding the River Murray *"Many people imagined that there would be nothing to fear from only flood waters being taken, but this was a great mistake. All the floodwaters were required to drive out the salt water"*. There was a fear that extraction of water for irrigation would cause the lower Murray to become impregnated with salt to a considerable distance above Wellington.

1887

A debate also took place in South Australian Legislative Council suggesting that *'Riparian Rights should be clearly defined before irrigation was undertaken on any large scale'*.

Point McLeay Aboriginal Mission requested a grant of 500 pound to set up an irrigation scheme to enable root crops to be grown. Mr Taplin explained that they wanted equipment to pump 30,000 gallons per hour from the lake after raising it thirty feet. He said *"the water in the lake was eminently suited for the purposes"*.

1888

South Australia complains of water extraction by New South Wales and Victoria. Local Member, Mr AH Landseer said the lower River and Lakes country was being destroyed *"by the encroaching of seawater for want of sufficient fresh water down the river to keep it back during low water"*.

1889

During a Parliamentary debate on locking the Murray, Mr Caldwell told the House that when it was found that *"the salt water was gradually encroaching upon the fresh water in the stream there was real cause for apprehension"*.

Talk of locking the Murray and constructing barrages at the Goolwa, Mundoo and Coorong channels.

1890

1892

Irrigation scheme for land from Milang to Angas Plains suggested.

For the last two weeks of May fishermen at Milang send 12,000 pound of freshwater cod to the Adelaide Fish Market.

Report on controlling outflow of water near Murray Mouth laid before South Australian Parliament in July.

1894

Debate in South Australian House of Assembly on the changed conditions of the Lakes. During the taking of evidence Mr Thomas Goode of Goolwa was asked what was the effect of the Lakes above Goolwa of low water in the river “*Does the water become salt?*”. He replied “*Yes; the water at Goolwa, and also the water in Mundoo Channel. I believe it is rarely salt so far up as Point Sturt, and at Milang more rarely still.*”

1901

Because of low river seawater is coming into river at Goolwa.

The Milang correspondent to the Southern Argus, commenting on the continued dry weather, said that many householders were without a supply of rainwater and had to “*depend on their kind neighbours or the lake*” for their water needs.

1902

Councils around Lakes begin urging the State Government to bring under notice of the Federal authorities the necessity of conserving the freshwaters of the lakes. Concern was expressed that the value of the land was decreasing. Mr Hacket, Chairman of Meningie council said, “*the land had been purchased from the Government at high figures owing to the beautiful fresh water frontage which it then possessed*”.

Murray Waters Commission whilst taking evidence at Victor Harbor, Goolwa and Milang on the state of the lakes were told that they were becoming saltier every year. A consequence was that reeds and waterweeds were being killed. Mr Allan McFarlane of Wellington Lodge said he had used the water for stock and irrigation for 45 years.

The Interstate Royal Commission on the River Murray noted that because the water level in the lakes was lower than usual “*instead of the water being fresh, as it should be naturally, it has either been brackish or as salt as the sea*”.

In October the Superintendent of the Point McLeay Mission, Mr F Garnet said about the salt conditions that “*despite the long drought the waters of the lakes have always been sweet at this time of the year, and more or less through the hot weather so that their present condition is quite phenomenal*”. In addition this presence of salt water was killing the waterweeds which the stock entered the water to graze. This in turn created a further problem as it rotted of contaminating the air and water. The fresh water fish supplies were reduced as well because “*they have been driven out of the lakes by the salting of the water*”.

1903

Bores and wells need to be sunk, around the Lakes, to provide water ‘*where hitherto there has been an unlimited quantity of beautifully fresh water in the lakes*’

Deputations met with the Premier of South Australia urging him to assert South Australia’s rights to a fair supply of water and press for the erection of locks and barrages.

The Southern Argus explained the salt water problem as being caused “*through the joint influences of long continued drought and an increasing diversion of waters*” This had meant that instead of the lakes being supplied with a “*constant flow of fresh water*” the result had been that “*instead of the river ‘rushing out to sea’ the tides of the ocean had flowed in*”.

The Sydney Daily Telegraph reported that Hindmarsh Island “*which used to support large herds of cattle on its succulent reedbeds, has been turned into a saline waste*”.

South Australia was under the impression that Victoria was extracting 75% of water in the upper Murray.

South Australia Parliament urged to construct barrages to restrict entry of seawater.

Federal Government suggested that a central body was needed to control the River Murray.

Mr Hacket, Chairman of the District Council of Meningie and Manager of Narrung Station said “ *The natural condition for the last 40 years of my own knowledge – if I except last year, which I admit was affected by the drought, but was intensified by diversions – was sufficient supply of fresh water to meet the requirements of settlers for their stock, and any divergence from these natural conditions is a direct infringement on the riparian rights which have been in existence for half a century*’.

.....

Mr Pearce of Point Sturt said that the reeds were dying and swamps were becoming useless for running stock on them because they were becoming impregnated with salt.

.....

Wells that had been dug a couple of years earlier to provide water, because of salty water in the Lakes, were also becoming salty.

Editorials in newspapers said that South Australia was not doing enough to press her case to maintain fresh water in the lakes.

Proposal to drain Lake Albert and reclaim the land.

.....

Talk of draining Lake Albert continues

.....

Thomas Walker Fowler of the Victorian Institute of Engineers suggests method to enable the Murray Mouth to be kept open for navigation.

.....

Murray Mouth sanded up in May.

.....

At the beginning of the year salt water came in to Goolwa and the Lakes but by October a big flood had come down the river.

.....

In January salt water enters again.

.....

River around Goolwa and Hindmarsh Island has stayed fresh for a long period which was welcomed by stockowners.

.....

Due to effect of north wind at Wellington the lowest river ever seen by white man was experienced in March.

A nauseous, green slimy scum that killed sheep and dogs was causing problems at Poltalloch and other properties.

The Southern Argus said that nothing had been done to protect the Murray despite it being talked about since that newspaper began in the 1860’s. “*But meanwhile the river is being so drained by irrigation works that its level is so steadily sinking that the lower stretches are becoming almost tidal, and the sea water is finding its way far up stream, so sluggish is the current opposing it. Lakes Alexandrina and Albert have been robbed of their value and character to a very great extent, and become a menace instead of a rich asset to the people resident on their shores, and unless barrages are put down there is prospect of each year finding conditions worse and worse*”.

1904

.....
1904

.....
1905

.....
1906

.....
1907

.....
1908

.....
1909

.....
1910

.....
1911

.....
1912

1913

The Mount Barker Courier reported that Mr Watts the Victorian Premier said at Mount Gambier when questioned about the problems South Australia believed was being caused to the River Murray in this State by diversions in Victoria that *'some time ago he made a sporting offer to buy all the land east of the Murray from South Australia'*.

1914

A barrage of sandbags was built across the Mundoo channel. If this scheme was effective it was envisaged that permanent barrages would be built across the four shallow channels near the Murray Mouth.

1915

Saltwater in the River at Mannum.

Willows at Wellington found to be dying as a result of salt water being there last year.

1916

Mundoo barrage to be demolished because of fears that it will cause the flooding of reclaimed swamplands near Murray Bridge.

1917

Major EN Johnston of the Corps of Engineers, United States Army forwards to the South Australian Government his report on the outlet of the Murray. He offers a choice of eight schemes ranging in cost from 644,000 pound to 2,358,000 pound.

1918

River has fallen to a low ebb and several inrushes of seawater were experienced.

1919

Another test barrage was constructed at the Mundoo channel. This time of timber, with sluice gates.

1920

Land holders around the Lakes wanted all the proposed barrages built.

1923

Suggestions made that both Lake Albert and Alexandrina be drained.

1924

Draining Lakes still talked about with a channel across them to a port for the Murray trade being built at the end. This was seen as an option to solve the problem of keeping the Lakes fresh.

1927

Prime Minister and party visited Goolwa to see where a canal would be built to provide access to the sea.

1929

Residents around Lake Albert condemn the proposal of draining it.

1930

Deputations meet with Minister of Agriculture regarding maintaining fresh water supplies in the Lakes. He was told that land *"values had been much higher on account of the fresh water facilities. Land owners felt they had a serious grievance as it looked as though they were likely to be robbed of their riparian rights by substitution of salt water for fresh"*.

The settlers at Narrung now needed to get their water from wells but *"were previously able to water at the lake frontage"*.

River Murray Commission again took evidence regarding the salinity of the Lakes. They were told that at Currency Creek the reeds and rushes had disappeared since the advent of so much salt water. The Chairman of the Bremer District Council said that *"The value of the land had depreciated, the stock capacity had decreased also, and water for stock was a serious matter"*. He referred also to damage to fodder growths, fencing and other resultant evils due to salt water, the reduced flow of the Murray from the upper reaches, which naturally accounted for lower lake levels, and the consequent easier contamination by seawater from the river mouth.

As a result of a public meeting at Strathalbyn a deputation met with the South Australian Commissioner of Public works to request that the fresh water condition of the lakes be conserved. He was told that both Lakes were “*perfectly fresh all year round, with weeds growing on its margin*”

1930

Opinion of whether barrages would solve the problems of salt water entering the Lakes through the mouth was divided.

1933

Evidence given to an Enquiry into the construction of barrages included from Mr Holtham of Narrung “*the reeds and rushes started to go out in 1914*”. “*I worked at Narrung for 5 or 6 years before salt water appeared (in 1912)*” Mr McNicol. ER Rankine of Hindmarsh Island “*I have noticed the reeds and grasses that grew along the edge of the river have gradually died. As soon as we get fresh water they come up again*”. Mr HCF Kruse said that whilst travelling from Milang to Meningie on the mail steamer Dispatch “*it was my job to fill a cask (for drinking water) every day for 5 years using nothing but lake water*”. Several farmers at Point Sturt said that many years ago the frontages were reeds, today frontages are sheets of water. The reeds were killed by saltwater. JT Cowan of Poltalloch said, “*prior to locking the lakes were never really salty enough to damage stock*”. The enquiry was also told that the problem of salt water in the lakes commenced after diversions upstream began. EL Goode of Goolwa said “*I can remember when it was a remarkable thing when salt water came up to the Goolwa wharf. Now we see salt water in the Lakes for months*”.

Second reading in South Australian Parliament of Bill to ratify agreement to build barrages.

1933

Mount Barker Courier reported in November that work would start immediately at a cost of 600,000 pound.

1934

Building of barrages commences.

1935



Goolwa Barrage looking towards Hindmarsh Island (2004)

1800s EUROPEAN DISCOVERY OF LAKES

The first Europeans to be aware of the existence of the Lakes, which we know as Alexandrina and Albert, were so called sealers from Kangaroo Island. From the early 1800's captains of sealing and whaling boats left crewmembers on the island to hunt the seals and macropods for skins. When the ship next ventured into local waters those left behind and the skins they had collected would be picked up. In addition deserters from passing ships also made their home on the island.

These men, at times, made trips to the mainland endeavouring to capture aboriginal women for workers and companions. Whilst on these forays they became aware of a large body of freshwater. In fact a sealer called George 'Fireball' Bates lived with a group of Ngarrindjeri for several months during which time he visited the Lake.

It was from descriptions provided by these visitors that it became more widely known of the existence of the Lakes.

For example a letter dated 14th May 1829 written by Lieutenant Sleeman, who was Commandant at King George's Sound, West Australia, says in part "*The schooner 'Prince of Denmark (sealer) arrived here on the 8th instant ... Her Master Mr. Forbes, who appears an intelligent man, has sent me an account of an inland lake, which his men discovered on their passage hither...*"

.....
1830

The first 'official' visit was led by Captain Charles Sturt with second in command George MacLeay, Sturt's servant Harris, soldiers Hopkinson and Fraser and convicts McNamee, Clayton and Mulholland. They had travelled down the river Sturt named the Murray (after the Colonial Secretary) entering the Lake he called Alexandrina (after Princess Victoria Alexandrina who later became Queen Victoria) on the 9th of February 1830.

He gave the following description of the lake. '*We had, at length, arrived at the termination of the Murray. Immediately below me was a beautiful lake, which appeared to be a fitting reservoir for the noble stream that had led us to it; and which was now ruffled by a breeze that swept over it*'.

It was partly because of Sturt's description of the countryside along the Murray and in the vicinity of Lake Alexandrina that the colony of South Australia was situated on this part of the Australian coast.

.....
1836

Ships bringing settlers to the new colony began arriving in mid 1836, settling at first on Kangaroo Island. Later with the arrival of William Light the surveyor a shift was made to the mainland and Adelaide was established. South Australia was proclaimed a colony in December 1836 and within twelve months the region of Lakes Alexandrina and Albert was being examined with a view to becoming available for settlement.

.....
1837

In early December 1837 Strangways and Hutchison travelled from Adelaide to the Encounter Bay whale fishery of Mr Blenkinsop. From here, taking the boat Currency on a cart, they journeyed to near the Mouth of the Murray where their trip to Lake Alexandrina began.

Leaving the cart plus four men (including an aboriginal) and provisions on the banks of a creek they name Currency after the boat, twelve men and two dogs continued upriver. Along the way they named Hindmarsh Island after the Governor, Sturt's Peninsula and Point Sturt after Captain Sturt and Point MacLeay after Sturt's second in command. They also named a small rocky island on which they lunched on the 6th of December Grindstone Island.

Two of the crew on the boat had previously walked from Port Fairy along the coast to the whale fishery. Finding that they could not cross over the mouth of the Murray they had made their way inland where they had constructed a craft from native pine logs and with a fifteen-foot pole and relying on the winds when the water was too deep to use the pole crossed to Point Sturt and continued their journey to Encounter Bay.

When at Point Sturt, Strangways and Hutchison's party found both the raft and pole used and after carving the date and their initials on the pole it was erected to mark the party's visit.

An attempt to cross from Point Sturt to Point MacLeay with a view to further examining Lake Alexandrina was made but because the weather was blowing a gale and raining and provisions were very low they abandoned the attempt and returned to where the cart and men were left.

Hutchison wrote in his diary that *'We started at six and rowed towards Point McLeay for the first mile we had less than 6 feet of water, it then gradually deepened to 15 feet in the middle, when it shoaled again, the water here was so pure that we filled our kegs'*

Late in December 1838 another group, under the leadership of Robert Cock, and including Finlayson, Wyatt and Barton visited Lake Alexandrina. With a horse to carry their provisions they left Adelaide with the intention of walking over the hills to the River Murray via Mount Lofty and Mount Barker. However, after leaving a river they discovered on the way (they named the Hindmarsh because it was twelve months to the day since Governor Hindmarsh had proclaimed South Australia) they were unable to penetrate the Murray scrub and returned to that river. (When Governor Hindmarsh learnt that the river had been named for him, because there was already one called the Hindmarsh near Victor Harbor he requested that it be renamed the Bremer after a military colleague.)

Following the river downstream this group eventually reached Lake Alexandrina where they found that *'The lake appears to be of vast extent, the waters being quite sweet and fresh'*.

After leaving the Lake they headed overland back to Adelaide striking another river a few miles away which they named the Angas in honour of the chairman of the South Australian Company.

The leader of this expedition, Robert Cock, who was a land agent, appears primarily to have made the journey searching for suitable land for agriculture.

.....

In 1838 Charles Sturt, who had made his home in South Australia, revisited the area to see if the entrance to the sea he had reached was the only one that existed. He found no other but pointed out at the end of his report that the conditions he had found at Lake Alexandrina and near the Murray Mouth during his 1830 visit was not what he believed normally existed. Explaining this belief he said *'I cannot close this report without remarking on the increased and singular depth of the channel of communication, which in March 1830, I found so shallow that I could not by any effort pass down it – that the change must be attributed to heavy freshes there can be no doubt, and to the constant of the current in one direction outwards.'*

During my late visit I never observed the sea running in, but a strong current always setting out of the channel. From what I observed, I am led to think, that the level of the lake is above high water mark. The narrowness of the channel preventing the body of water thrown into it, by the Murray from being thrown out in the same proportion. The immense body of back water in the chain of lagoons, would be an argument in favour of this supposition.'

.....

In 1839 cattle and sheep began being brought from New South Wales to South Australia by parties called Overlanders. One of the first to make the journey was a led by Charles Bonney who upon reaching Lake Alexandrina commented *'came upon a point of the main lake, the water of which was perfectly fresh. The shores were also covered with reedy flats, which were in some places half a mile in breadth'*.

1839

Another Overlander, George Hamilton, who also came via Lake Albert and Alexandrina, lost control of his mob of cattle near Lake Albert. They had not had water for a few days and when they smelt water in the distance they rushed towards it. Hamilton who said *'the waters of which I fancied were salt'* tried to stop them but he, his men and their dogs were unable to do so. Completely exhausted and with men, horses and dogs *'knocked up'* he was forced to watch them disappear toward the Lake. Upon regaining his breath he continued on *'I crawled to the top of the knoll and looked forth. There in the distance was the lake; the head of the line had just reached it, and I drew in my breath as I saw them go into the water and bend their heads to drink. And they did drink, and as the rear came up they spread themselves on the shores and drank too. Here was the surprise – the lake's banks were not rotten, and the water was at least drinkable, for none of the cattle refused it. Returning to my comrades, I announced to them this astonishing result. Remounting our horses we followed on the tracks of the herd, and we were soon tasting the water – it was fresh, and it was not salt; it had a vapid sweet taste, but it quenched our thirst. Millions of wildfowl must have been on the surface of this lake. As we reached its borders they rose in dense clouds, darkening the air'*.

1839 also saw Special Surveys being taken up in the vicinity of the Lakes. Special Surveys were large tracts of land that were surveyed at a cost to those wishing to take up the land provided they also made land available within the survey for purchase by small landholders. There were several Special Surveys near the shores of Lakes Alexandrina and Albert. They included Currency Creek, Wellington, Poltalloch and the Angas.

Some of those who had land in the Angas Special Survey such as Rankine, McLean and Stirling also took up Occupation licences on land around Lake Alexandrina and on the islands near the Murray mouth.

1840

In 1840 Sturt again visited the region, this time as a member of Governor Gawler's party who travelled in boats upriver to about present day Morgan. On this trip they passed across Lake Alexandrina which Sturt referred to as a *'magnificent sheet of water'*.

Also in 1840 Surveyor General Frome with a party of surveyors began making a detailed survey of the Lakes. In his report to the Governor Frome said they succeeded *'in getting the whole of the shores of Lake Albert and nearly the entire circumference of Lake Alexandrina accurately surveyed during the three weeks I was out'*

Milang Jetty early 1900s



In this report he made the following observations *‘From the junction of the Murray with Lake Alexandrina nearly opposite Pomanda in latitude 35 25 37, the ground on the eastern side/shore is a sandy flat, affording tolerable pasturage, but it improves gradually to the southward, and where the shore begins to trend to the westward the soil becomes excellent, and maintains a breadth varying from half a mile to about a mile and a half as far as the rocky point (Point Malcolm) forming the N E entrance into Lake Albert in latitude 35 31. The rising ground at the back of these flats though sandy, yet affords excellent back runs for cattle, and the hills are well timbered with Banksia, Casuarina, and some of the largest pines I have seen in the colony –*

Along the eastern and southern shores of Lake Albert, the same character of country continues; the soil, however, appeared to be still better, and the flats more extensive, particularly about 15 miles from the entrance, where we crossed a swamp formerly a deep inlet from the Lake. The land on the western shore I did not ride over, but Mr Nixon also Mr Poole, whom I detached to survey this part of the Lake reports it to be of the same nature, the flats however are not backed by high land’

In regard to the water in Lake Albert he said that *‘we found in some parts very good in others slightly brackish but quite fit for use, and from the permanent nature of the huts of the natives, and absence of native wells, I should imagine they continued so the greater part of the year’*

.....

The South Australia Company had taken up land near Lakes Alexandrina and Albert with sheep being kept on the Point Malcolm side of the Narrows and cattle on the Point MacLeay side. Dudley Melville an 18 year old lived in a hut where Raukkan is now. The roof of this hut was made of reeds that had been soaked in limewater to retard them from catching on fire. The *‘reeds, which grew on the lakeshore nearby’*, Melville said also offered concealment to the aboriginals who speared cattle as they went to the Lake for water. Because of this he said that when he went through the reeds to get drinking water, from the Lake, he did so with a bucket in one hand and a gun in the other for protection.

Goolwa late 1800s



1844

S Davenport, who managed the Macclesfield Special Survey for his father, received a letter from him enquiring why they had not taken up additional land on the Lake. His reply said *'we were rather late to seize the lake runs, the Strathalbyn proprietors knew their value and divided the whole before we came'*

Later he explained to his father that *'Cattle are left quiet about the Lake – have an abundance of good water in the spot (the reeds) where in summer their best feed lies. The reeds in conjunction with land grasses are very nourishing, and cattle fatten well and fast'*

To overcome the lack of lakefront land the Davenport's later became involved with the Malcolms at Poltalloch.

1850

In December 1850 Surveyor General AH Freeling and Collector of Customs RR Torrens surveyed the Lake and in their report provided the following description of the Goolwa channel and Lake Alexandrina *'Winding around Hindmarsh Island, it flows with a gentle current in open reaches, about a mile in average width, through which the navigable channel is upwards of 300 yards wide, averaging one and a half fathoms and plainly indicated by the colour of the water. (the soundings given by Pullen average 6 to 32 feet.) The course is 17 miles terminating at point Sturt. The Lake Alexandrina opens out round point Sturt, from whence to point Pomond, the entrance to the Murray, the course is 35 miles. The soundings give one and a half fathoms with plenty of room; water occasionally brackish.*

From the 1850's surveying of the country into Hundred and Sections began opening the districts up for closer settlement. As well, towns such as Goolwa, Clayton, Milang and Meningie were laid out.

In the 1850's trade commenced on the River Murray using it as a 'highway'. The South Australian Government offered a prize to the owner of the first boat that successfully navigated the river. William Randell in the Mary Ann and Francis Cadell in the Lady Augusta taking up the challenge. (Cadell was awarded the prize because Randell's boat did not meet specifications set.)

Steamers and barges were soon being used to move produce and goods up and down the river. This system of transport, with its provision of easy access to markets, provided the opportunity to develop agricultural pursuits other than wool and cereal crops.

The opening up of the river as a route for goods and produce showed how strategically placed South Australia was to receive the majority of this trade.

Therefore a plan to build a port, which would enable cargo to be dispatched and received, near the termination of the river was conceived. It was believed that with a Port on Encounter Bay, at the Murray Mouth or the River itself at Goolwa (with direct sea communication) the necessity to offload cargo at Adelaide (or one of the other capitals) and then move it to the river would be rendered unnecessary.

Because of the riverboat trade the River Murray and the Lakes took on fresh importance in the eyes of South Australians.

3. European settlement caused change

The following information details the conditions found in Lakes Alexandrina and Albert and the area near the Murray Mouth from 1842 to 1940. It explains that changes to the quality and quantity of water in the Lakes began in the 1880's. The Lakes system over the years changed from a predominately freshwater one that occasionally had seawater intrusions to one that was salt for long periods. This change had, by the 1930's, resulted in the need to commence building a series of barrages to exclude that seawater.

The following begins with Sturt's suggestion in 1842 to direct all the flow of water into the Goolwa channel to make the Murray Mouth safer for navigation and ends when those barrages were built.

Information shows that extractions of water from the river system upstream in New South Wales, Victoria and South Australia, along with prolonged drought conditions, caused change within the Lakes. The conditions experienced by landholders, river traders and the many who made use of waters of the Lakes is described. As this change began so did a 'fight' to restore and maintain the freshwater that those users believed was their right.

There were many plans, schemes and ideas suggested down through the years to control and regulate the area. As stated this document begins with Sturt's 1842 suggestion to harness the flow of water down the Murray and out to sea for the purposes of navigation. Later, when this flow began to lessen, plans altered to become aimed at retaining freshwater in the Lakes. This was seen as a better option than letting it run out to sea to 'waste'.

Then when flow further diminished the purpose became the exclusion of the seawater that was invading the system. The barriers that were designed to exclude seawater were also seen as a means to restore freshwater conditions.

What finally resulted after one hundred years were the five barrages, Goolwa, Mundoo, Boundary Creek, Ewe Island and Tauwichee that are in place today

.....
Letter from Charles Sturt, 15 May 1842 to Governor of South Australia, suggesting a Causeway be built from Hindmarsh Island across to the Narrung Peninsula to 'throw' all the waters into Goolwa channel to keep Murray Mouth open for navigation.

.....
GW Goyder, Surveyor-General proposed to cut bar in the Mundoo channel and so concentrate action of the river water for scouring a channel through the bar at the river mouth.

Petition presented to Governor Sir RG MacDonnell for improvement of the Murray Mouth to facilitate navigation of the Murray. It was suggested that the waters should be confined in one channel and so allow them to flow into the sea in one direction.

Surveyor General, Captain Freeling, in a report following this petition favoured the removal of the bar in Holme's Creek as well as other works. The estimate to carry out these works was 10,230 pound.

(In a Parliamentary Paper No. 14 of 1856 (Legislative Council), a suggestion is made for improving the Sea Mouth of the Murray, by removing a rocky bar that runs across Holme's Channel, having an average depth of four and a half (4 1/2) feet of water upon it.)

1842

.....
1856

1856

In the book 'Engineering in South Australia' by W Bennett Hays writing on the River Murray. He said '*It would appear, from an inspection of the map, that the Murray discharges itself into the broad expanses of Lake Victoria; it would be more properly described as passing through the lake, the river takes its course around Hindmarsh Island, which it separates from the mainland, in a channel bearing the name of Goolwa or Lower Murray. The last 6 or 8 miles is separated from the sea, to which it runs nearly parallel only by a line of sand hills less than half a mile in width.*

Murray mouth barely 200 yards wide.

The union with the waters of the ocean seems after all to have been accomplished only by a sort of compromise, the understanding being that the river, during the time of its periodical flooding, should be permitted to excavate for itself a channel just sufficient for the passage of its waters, which seldom exceeds 15 feet in depth, while in the interim the ocean should be at full liberty to work away at filling up the same, which it never fails to punctually perform, generally managing before the return of the freshes, to reduce the outlet to a depth of from 4 to 6 feet.

At the season when there is sufficient depth of water, a strong current is always setting out'.

1857

Naval Officer and Harbour Master, B Douglas made a survey of Murray Mouth. He reported that the Blanche had entered from Port Elliot on March 25th.

Mundoo Island had had beacons placed on it and river beacons and buoys had been installed to provide a guide for passage over the bar.

A flagstaff had been placed on Barker's Knoll to indicate the mouth from the sea. Douglas said that on 33 of the 42 days he was at the Mouth it would have been navigable.

1857

General Council of Australasia sat in London, and a proposal was submitted for improvement of Australia's great river systems.

1857

Mr George Abernethy proposed, by piling, to direct the tidal scour more effectively across the bar. George Abernethy Engineer to the Harbour Trust recommended separating the currents of the Goolwa and Coorong channels with piling where they came in direct contact and to protect Barker's Knoll by piling to prevent it from being washed away. He estimated the cost would be 29,000 pound.

1857

B Douglas made a further survey of the Mouth. He found that a 100 yards of the eastern end of Pullen's Point had been removed '*by the force of the descending current*', its northern side had receded by 50 yards, its southern limit had extended by 125 yards in one direction and had contracted on its southwestern side by nearly 180 yards. The buoy off the spit of Point Pullen was removed as it was now in 30 feet of water as opposed to 9 feet in April. Barker's Knoll had also receded 15 yards since April.

1859

Douglas noted the following changes, the northwestern edge of Barker's Knoll had receded upwards of 200 yards in a southeasterly direction, Point Pullen's Spit had advanced '*in the same quarter nearly an equal extent*'. The shoal southward of Sir Richard Peninsula at the eastern end nearly extended to the centre of the channel over the bar as it existed in 1857.

1859

A select Committee of Parliament reporting on the feasibility of a tramway from Strathalbyn was also directed to '*consider*' the suggestion made by Goyder in 1856 of cutting a channel through the neck of land below the bar, across Holmes Creek.

The Committee believed that not only would it be too costly to cut the channel, but it *'might lead to serious and irremediable injury, instead of producing the desired result'*.

1859

Representatives of New South Wales, Victoria and South Australia met in Melbourne, and passed resolutions in favour of locking and conservation of the River Murray, for purposes of commerce, as a Federal project.

1863

Mr Boothby proposed a ship canal from Goolwa to Encounter Bay to provide 20 feet at low water and was to be protected by two breakwaters each 4320 feet long.

1866

Surveys were taken of the River Murray, with view to inter-State locking.

1872

A resolution was carried in the House of Assembly of the South Australian Parliament, in September, to the effect that *'It is desirable that a survey report of the Murray mouth should be made, to ascertain how far it can be made available for navigation, and also with a view to the construction of a canal between Lake Alexandrina and the sea together with an estimate of the cost'*.

1873

The result of this request was the following report "Examination of the Murray Mouth by the Marine Board".

'In accordance with your request conveyed in minute dated 15/11/73, on Treasury letter 731/73, that the Marine Board should visit the Murray Mouth for the purpose of reporting on the feasibility of improving the entrance to that river. I have the honour to state for your information that the Marine Board visited that locality on the 19th instant and after carefully examining the same, have unanimously come to the conclusion that on account of the extraordinary natural changes which have taken place at the embouchure of the Murray since the surveys of 1857 and 1859 were made, nothing can be done to improve the same, unless at enormous expenditure of public money.

The Board is fully convinced that the entrance partakes of the nature of quicksand, as it feels so under foot, which would render any operations thereon not only dangerous in the extreme, but futile in attempt.

The bar must be very shallow at present, for every sea, which at times broke right across the channel, was highly discoloured with sand.

It would have been foolhardiness to have attempted to take soundings on the bar during the visit of the Board, and there must be a long continuance of fine weather to allow of such proceeding. Outside the line of breakers the sea was quite smooth, and the weather had been fine for some time.

Barker's Knoll, which in 1857 formed the extreme west point of the eastern side of the channel, and about 100 feet in height, has been completely swept away; and since the above year, mid channel has shifted three-fourth (3/4) of a mile further east. Point Pullen has also grown out in the same direction, and is now dry at high water, where in 1857 there appears to have been not less than fourteen to twenty feet at low water.

The Board would remark that frequent and almost unaccountable changes must take place where such a volume of water runs out to sea; for with the frequent westerly gales, accompanied by a heavy ocean swell, which uninterruptedly runs along the unprotected coast, must dam back not only the waters, but also the large amount of alluvial deposit brought down the Murray during floods, and alter not only the contour of the channel, but also the depths of the water, in an extraordinary degree.

The Board regret exceedingly that they cannot report more favourably on the entrance to this noble river, at the same time would respectfully suggest, for the consideration of the Government, the desirableness of having the entrance resurveyed at an early date, if only for comparison with former surveys, and showing the extraordinary changes which have taken place.

1873

It is just possible, now that the entrance runs straight out, or nearly so, in a line with the channel dividing Mundoo and Hindmarsh Islands, that the scour there from meeting the currents from the Goolwa and the Coorong nearly at right angles from either, may tend to keep the channel or entrance in nearly the same direction for some time, but sooner or later it will alter; at all events such is the case with all bar harbours the Board has knowledge of.

In order to arrive at some definite conclusion respecting the frequent alterations which are continually taking place at the Murray Mouth, the Board is of the opinion that periodical surveys should be made for a series of years. By doing so, they would place beyond doubt the practicality or otherwise of rendering the entrance safe for navigation in all weathers, and at any time of tide’.

1874

Mr HC Mais recommended the cutting of a canal direct to the sea just below Goolwa. Cost 355,000 pound.

1874

Fourteen owners and masters of vessels trading on the River Murray submitted a petition to the House of Assembly of South Australia expressing their interest in the move ‘*to call for surveys and estimates of the cost of opening a water communication between the river and Encounter Bay*’.

Several days later the House of Assembly of South Australia received another petition. This petition was from 532 ‘*residents of South Australia and others interested in the development of the River trade*’.

In addition the Mayor and councillors of Goolwa caused a Bill to be prepared ‘*for an Act to authorize the construction of a Channel or Canal for the purpose of connecting the Port of Goolwa with the sea, and for other purposes*’.

1876

Lieutenant Goalen remarks in his survey of 1876 that ‘*the main object of both of the proposals has since been realised by natural means.*’ *It is unnecessary for me to enlarge upon this proposal further than to say that so far as it tended to meet the particular question of the confection of the currents, and the preservation of the shorelines, the principle treatment was quite sound. I, however, concur with Mr Hickson in the opinion that the extent and direction of it would have been open to improvement under the then existing circumstances’.*

1876

Mr Hickson recommended a breakwater and other works for the establishment of a port inside the bar at the river mouth. Cost 1,500,000 pound. He recommended that the entrance channel of the River Murray should be fixed by piling on both sides, immediately at the mouth and for a considerable distance within, and a certain amount of similar piling to fix the spit at the southeast corner of Hindmarsh Island.

A further and by far most important part of Mr Hickson’s proposals consisted of the construction of a breakwater, 8260 feet long, for the purpose of sheltering the entrance so that a dredger could be brought to work on the bar; or supposing the mouth not to be deepened, he contemplated the establishment of a transshipping place inside the proposed breakwater. If dredging needed cost 1,500,000 pound, no dredging 1,180,000 pound.

1876

Mr H Boothby proposed the plan of a canal of 20 feet depth through the sandhills from Goolwa to Encounter Bay with two breakwaters each 4320 feet long.

1879

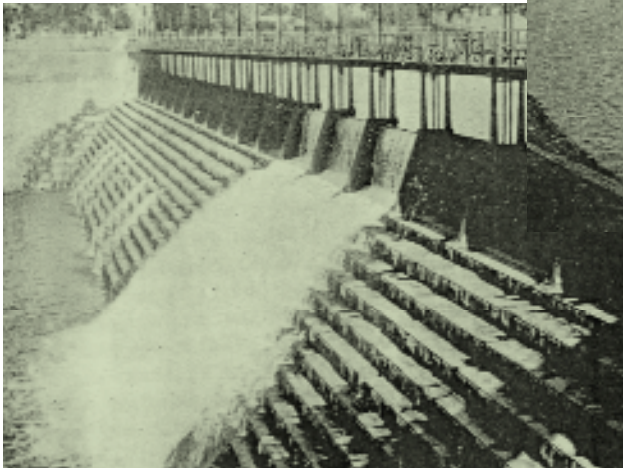
Sir John Goodes proposed to construct two breakwaters projecting from the shore and parallel, plus contingent works. Cost 2,000,000 pound. The breakwaters would be about 11,000 feet long at Murray Mouth.



Goulburn River after diversions have been made, early 1900s (from Nile of Australia by David Gordon)



Goulburn diversion channel, early 1900s (from Nile of Australia by David Gordon)



Goulburn River weir, early 1900s (from Nile of Australia by David Gordon)

A Royal Commission was formed in New South Wales to enquire into the rivers question.

1884

Victoria and New South Wales met and settled the question as to the rights of their respective colonies to the waters of the Murray. (New South Wales declined to recognise that South Australia had any rights whatsoever.) An agreement was drawn up and signed between the two colonies. Part of this agreement stated *‘That the whole of the waters of the Upper Murray and its tributaries, and the whole of the waters of the Lower Murray, shall be deemed to be the common property of the colonies of New South Wales and Victoria. And, subject to the reservation of such compensation water as the trust may from time to time determine, each of the said colonies shall have the right to take and divert one-half of such water at such point or points which may, at the sanction of the trust, be fixed on most suitable for the requirements of such colony: Provided always that the totals of the quantities so diverted by the two colonies, when the whole surplus (after providing compensation water as above) is utilised, shall be equal.’*

1885

Parliamentary Paper 59 (South Australia). The first time that the question of the Murray Waters was brought to the notice of the various Governments was in 1886 according to Attorney- General of South Australia in the Murray River debate of 5th October 1904.

1886

1887

19 July. During a Parliamentary Debate in the South Australian House of Assembly on Murray River Waters the Hon. J Rankine, talking on taking of water for irrigation and the effect it would have on the river further downstream said *'Many people imagined that there would be nothing to fear from only flood waters being taken, but this was a great mistake. All the floodwaters were required to drive out the salt water so as to keep the lakes and a portion of the lower river fresh for a few months in the year'*.

Hon. RC Baker. *'If all the waters of the River Murray were taken to irrigate the Riverina we would not have them in South Australia. The effect of this would be that the Lower Murray would become impregnated with salt probably to a considerable distance above Wellington. This would be a disastrous state of affairs for South Australia. It would not only stop such irrigation works as those of Messrs Chaffey Brothers, but it would depreciate to a great extent the value of the land about the lakes'*.

1887

23 August. Debate held in the South Australian Legislative Council on Riparian Rights considered that *'The Question of Riparian Rights should be clearly defined before irrigation was undertaken on any large scale'*.

When the Chaffey Brother's Bill was under consideration it was suggested that a provision should be made preventing the taking of such an amount of water as would render the waters in the Lakes salt, but the Chief Secretary objected, as the practical effect would be that the Government would be liable if any damage would be done to the quality of the water below Bookmark

1887

South Australia appointed a Commission and approached New South Wales and Victoria to see if some amicable arrangement could be arrived at in regard to the River Murray. (Nothing eventuated and it was believed that Sir Henry Parkes, Premier of New South Wales was the reason.)

1888

The Mount Barker Courier, in June, carried an item in the General News section regarding a deputation from the Point McLeay Mission meeting with a member of the Government, Mr Catt, and asked for a grant of 500 pound. This money was to be used for carrying out irrigation works at the Mission that would give work to several natives and enable a root crop to be grown. They wanted to purchase machinery to raise 30,000 gallons per hour to a height of 30 feet. *'The water in the lake was eminently suitable for the purposes'* and Mr Taplin pointed out that there was a plentiful supply of this good water.



Point Mcleay Mission late 1800s

PHOTOGRAPH BY THE NATIONAL ARCHIVES

European settlement

In September a debate, brought about because of water extractions by New South Wales and Victoria, on Riparian Rights took place in the South Australian House of Assembly. During the debate Mr Landseer said, *'It is patent to myself and others who know the Lower Murray and lakes that the whole of the country will be given up to the inroad of seawater directly the irrigation colonies are in anything like full working order. At the present time the water is salt in Lake Alexandrina, and is fast getting salty in Lake Albert, and in a short time will be to Wellington and above. The result will be, unless some action is taken to prevent it, for every 1,000 acres of land irrigated by these companies to put money in their pockets 10,000 acres will be ruined in the Lower Murray and lakes of South Australia'*.

1888

.....

A motion was adopted in the House of Assembly of South Australia with view of meeting with Victoria and New South to consider the advisability of passing a scheme for locking and conservation of the waters of the River Murray. New South Wales refused, at the instigation of Sir Henry Parkes, to meet with the Commission.

.....
1889

.....

Mr Landseer, MP, in debate on riparian rights suggested that. *'A weir should be constructed at the lower portion of the river close to the mouth, and a smaller one would have to be constructed on the Coorong'*.

.....
1889

.....

Mr Burchell of the Water Conservation Department of South Australia proposed to close the Murray Mouth by a weir which would be high enough to keep out the spring tides, and then a channel should be cut about 7 miles distant from the weir and 1 mile from Goolwa, across to the sea, so as to admit ocean going steamers. The length of the canal would be from three-quarters of a mile to 1 mile. He believed there was no necessity to lock the river until Morgan. This would raise the river 20 feet.

.....
1889

.....

18 September. During Parliamentary Debates in the South Australian House of Assembly regarding Riparian Rights on the River Murray, Mr Caldwell spoke for Mr Hussey and explained that *'the drainage of waters by various kinds of works are very heavy. These irrigation works are, no doubt, very valuable, and no doubt also very interesting; but they may prove really disastrous in regard to this invaluable river'*. As well it was pointed out that *'filthy waters of all kinds is being emptied into the river'*.

.....
1889

In addition *'A disregard of the rights of this colony has been very conspicuous in nearly all that has been done up to the present. For example, the Chaffey Brother's works have been erected right in the fairway of the river, and in the assertion of the rights of this colony it will be incumbent upon us to give the notice that they are trespassing'*. Mention is also made of the fact that there is a *'terrific waste of water by percolation alone'*.

Under a Victorian Act power had been given to establish, for irrigation purposes, 16 trusts representing an area of 854,044 acres. These trusts all draw water from the Murray. On the eastern side of the borderline are the Goulburn, Broken, Loddon and Campaspe rivers. These are all Victorian tributaries, feeding the Murray from the Victorian side. *'It is estimated that the drainage of these new works for irrigation and other purposes from the river would be in excess of all the waters of these small rivers which feed the Murray from the Victorian side and 3150 cubic feet per second besides'*.

There are now 16 companies drawing their waters from the River Murray, and there are under consideration applications from 12 other sets of persons, which, if granted, will represent another area of 811,280 acres. Hence the total area represented by these trusts will considerably exceed 1,600,000 acres.

1889

25 September. Debate occurred in the South Australian House of Assembly on Riparian Rights to the Murray. This debate was brought about because of the extractions by New South Wales and Victoria of water from the Murray.

Mr Landseer told the members that, *'The question had two very important bearings for South Australia – the destroying of the lower river and lakes country by the encroaching of seawater for want of sufficient fresh water down the river to keep it back during low water, and the serious effect on navigation of the river. It was only within the last three weeks that the water in Lake Alexandrina had been absolutely fresh, notwithstanding the volume of freshwater coming down. This was because once the water got salt it was difficult to get it fresh again. A weir should be constructed at the lower portion of the river close to the mouth, and a smaller one would have to be constructed on the Coorong'*. He also stated *'During the last three years Victoria had entered into very important irrigation schemes on the larger tributaries of the Murray as well as the Murray proper and projected other large schemes. Irrigation works on the Darling and Murray the effect of which when completed would be to convert the lakes and Lower Murray into salt water river and lakes, utterly destroying the magnificent tract of country on the Lower Murray and Lakes. The lakes had been brackish for the last three months of the year; it was only about three weeks ago that the freshwater was able to totally overcome the salt. This put beyond doubt the ultimate result, as if with low water seasons and the present irrigation works going on this was the state of the lower river and lakes, when all the irrigation colonies and works were in full work that were proposed the lakes and lower river would be as salt as the sea for the best part of the year if some such work as a weir was not constructed to hold the sea water in check during low water season.*

It is patent to myself and others who know the Lower Murray and lakes that the whole of the country will be given up to the inroad of seawater directly the irrigation colonies are in anything like full working order. At the present time the water is salt in Lake Alexandrina, and is fast getting salty in Lake Albert, and in a short time will be to Wellington and above. The result will be, unless some action is taken to prevent it, for every 1,000 acres of land irrigated by these companies to put money in their pockets 10,000 acres will be ruined in the Lower Murray and lakes of South Australia.

It was of high importance to prevent the Murray water from being rendered brackish at certain seasons by tidal influence'.

The Commissioner of Public Works, Hon. JH Howe, *'from a report by Mr Russell, the Government Astronomer of New South Wales, that the rainfall in the basin of the River Darling in 1879 only 2.32 per cent reached the sea. In 1885 the proportion was only 0.13 per cent, and of the rainfall in the catchment area of the Murray only about 25 percent reached the sea.'*

He also said *'We were not only faced with the view that the waters of Lake Alexandrina and Albert became salt except at flood times, but that the bed of the river might become dry, because in our territory the river was entirely fed by waters that came from the neighbouring colonies of Victoria and New South Wales'*.

1889

16 October. A Debate took place in the South Australian House of Assembly on Locking the River Murray. Mr Glynn moved *"That in the opinion of this House the Government should carry out a scheme for locking the Murray."* He said that *'The first thing to consider was the capacity of the Murray, and it was important to do so at the present time, because the schemes contemplated here and in other colonies would practically exhaust the navigable waters of the Murray'*.

From a report to the South Australian River Murray Commission by the chairman Mr Jones it was stated that the schemes would require 216,260 million cubic feet per annum, and the discharge of the Murray at Morgan in 1884 amounted to 224,788 million cubic feet, and in 1885 to 240,014 million cubic feet. The full diversion of water

European settlement

required by these schemes would exhaust the discharges of 1884 and 1885, as the figures were less than the amount that would be left for these schemes.

The report went on to say *'It is manifest that with the diversion of 244,112 thousand million cubic feet per annum in Victoria and New South Wales, the river within the South Australian border would be dry in such years as 1884-5, and reduced to an average summer level during the whole of 1886.'*

Mr Glynn. *'The discharge past Morgan from June, 1886, to June, 1887, was sufficient to cover 13,000,000 acres a foot deep, or sufficient to fill up Lakes Alexandrina and Albert with an area of 320 square miles 60 feet deep. The discharge in 1887-88 was equal to covering 17,000,000 acres a foot deep, or filling the lakes about 80 feet deep.'*

.....

23 October. A Parliamentary Debate was held in the South Australian House of Assembly on Riparian Rights to the Murray. *'At present 2,300,000 cubic feet were passing Morgan per minute, sufficient to irrigate 9 1/2 million acres, reckoning 90 to 100 days as the season flow'*. (It was estimated that thousands of tons were drawn off for irrigation above South Australia's boundary).

.....

Mr Hussey. *'A report supplied by the Government of New South Wales showed that on the north bank of the river there are 70 trusts and other diversions, which use in summer 765 cubic feet of water per minute, and in winter 1,065 cubic feet per minute.*

On the south or Victorian bank there were 63 trusts and other diversions, taking in summer 46,577 cubic feet per minute, and in winter 161, 618 cubic feet per minute. It was therefore no wonder people were complaining that the lakes near the Murray mouth are going salt.'

It was found the Loddon could not afford a supply for irrigation to all those claiming to share its use, and in May 1887, it was recommended by the Chief Engineer of Water in Victoria to supply the lower part of the Loddon River, from a point some miles above Kerang with water from the Murray by way of Kow Swamp

.....

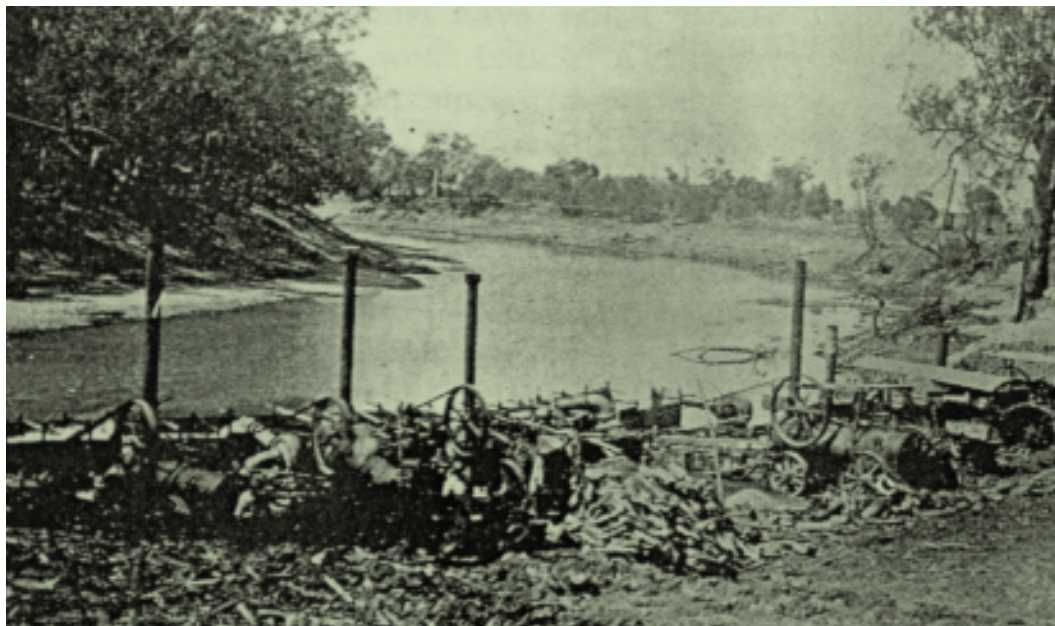
Mr Moncrieff's report number 144 recommended barrages in Goolwa channel, near Reedy Island, on Mundoo Island, Boundary Creek and across the Coorong. These barrages would be solid up to low water of an ordinary spring tide (RL 106) and above this gates provided.

1889

1889

1889

1890



Combined irrigation trusts, Victoria, pumping from River Murray, early 1900s (from Nile of Australia by David Gordon)



Narrung Jetty late 1800s



River Murray below Renmark, showing how the flow is reduced by upstream diversions, early 1900s (from Nile of Australia by David Gordon)

Southern Argus, 31 July. *Locking the Murray. It will be remembered that some little time back the Hon. JH Angas moved in the Legislative Council for a report from the Engineer-in-chief as to the practicality of controlling the outflow of water at or near the Murray Mouth by means of locks or dams.*

This report was laid before the House on Tuesday, the estimated cost of the works – Weir A (Goolwa channel) 20,800 pound, lock (Goolwa channel) 5,480 pound, weir B (Mundoo channel) 4,330 pound, Weir D (Coorong channel) 12,300 pound, intermediate embankment 1,300 pound, keeper’s house 470 pound, engineering, surveying and supervision 5 percent 4,690 pound, total 51,600 pound. The barrages being solid will conserve the river to the level of ordinary low water.

.....

The issue of the River Murray and the Murray Waters Commission was debated in the South Australian House of Assembly during September. In this debate mention was made of Parliamentary Paper No. 131, of 1889 which referred to ‘a report therein laid before the New South Wales Parliament on August 22, 1889, that at that date works were in actual operation, or in progress in the colonies of New South Wales and Victoria, on the northern and southern banks of the River Murray (excluding those to be supplied from the Rivers Ovens,

Campaspe, Goulburn and Loddon), which would divert 54781 million cubic feet per annum, and since the date of that report, now 5 years ago, other schemes had been mooted and in some instances were commenced’.

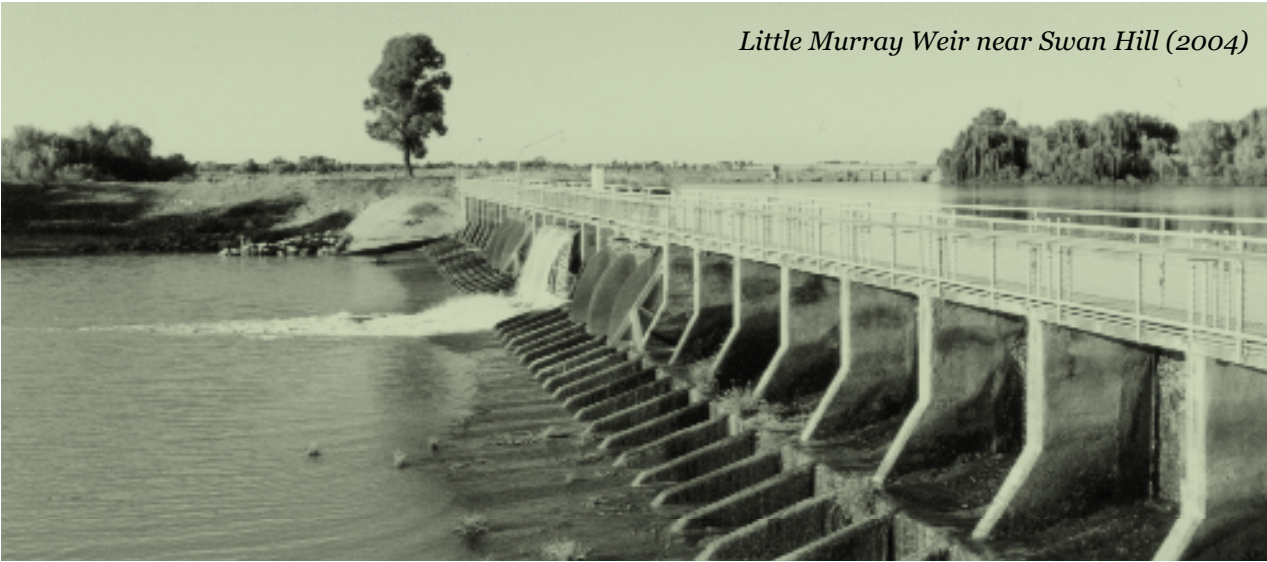
Background information laid before Parliament on the conditions found in the Lakes and Goolwa area included ‘Mr Thomas Goode, of Goolwa, and an old resident, gave the following evidence: - What is the effect on the lakes above Goolwa of low water in the river; does the water become salt? – “Yes; the water at Goolwa, and also the water in the Mundoo Channel. I believe it is rarely salt so far up as Point Sturt, and at Milang more rarely still. But lower down the river, say at the entrance to the lakes and in the Mundoo Channel, the water is salt usually three months in the year, I should suppose. I presume because the water in the river is lower than the tidal water from the sea’.

Mr Landseer also, speaking in the House on the Water Conservation Amendment Act, said – “During the last three months Lake Alexandrina had been as salt as the sea, and for six weeks he had to supply his horses with water from other sources. If the natural flow of water at the present time was not sufficient to keep the lakes fresh, what would be the result if they went in for the colossal works proposed?”

Mr JW Jones, the Conservator of Water gave the following evidence; - “So far as I know the salt water has never reached Wellington. During the last year for a period of 104 days at Goolwa, and about the same time at Milang, the river and lake water was either salt or brackish, showing to what extent the lower part of the river is affected by the influx of the seawater. Provided that the irrigation works go on, on the lines and to the extent contemplated, under existing conditions there would be a considerable number of summer months when the water in the lakes would be salt instead of fresh, and that the saltiness would also exist up to the Murray Bridge, and higher still, would it not? – Yes; I think so decidedly.’

Mr FE Hyde, who spoke from 26 years’ experience, in answer to question 630 stated: - ‘I am quite sure that if the river is much more deteriorated than it is at present Lake Albert waters will not only become salt, but the lake itself will gradually silt up. I should estimate there are 140000 to 150000 acres of freehold land that would be affected, and probably 500000 acres of leasehold’.

Little Murray Weir near Swan Hill (2004)



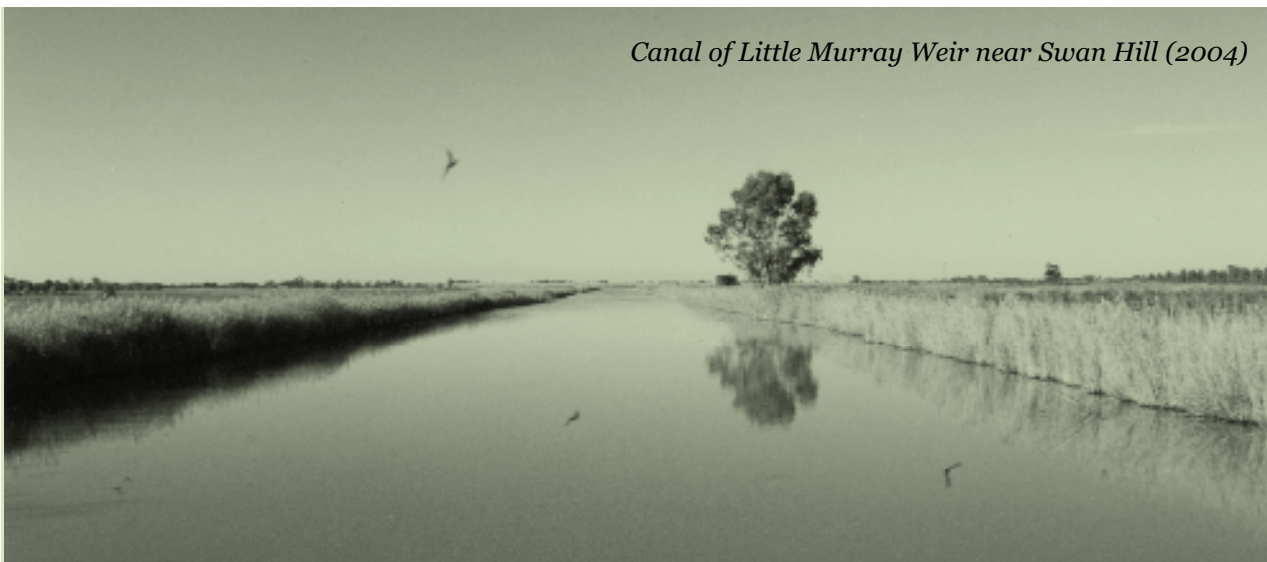
1902

The Corowa Conference convened by the River Murray Canal League was attended by 56 delegates (4 only from South Australia) One of the Six resolutions passed was *“That the Federal Government be requested to collect data and have permanent surveys completed, with a view of constructing weirs and navigation locks in the River Murray with the least possible delay.”*

27 February, The Mount Barker Courier reported that a deputation of people concerned with changes occurring to Lakes Alexandrina and Albert met with the Premier of South Australia, Mr JG Jenkins. At this meeting Mr Fischer, chairman of the Brinkley District Council, pointed out that the gardens around the lakes were becoming impregnated with salt owing to the influx of the seawater and that they were speedily being ruined. A very large amount of money had been spent in the neighbourhood, and already for miles along the banks of the lakes and the river the water had become unfit for the use of stock. Some means should be devised to prevent this. It would be a National calamity if the valuable country of the district were rendered useless.

Mr Hacket, chairman of the Meningie District Council, said that it was only too plain that the land was decreasing in value owing to the growing saltiness of the water. The land had been purchased from the Government at high figures owing to the beautiful fresh water frontage which it then possessed. For some years Renmark and Mildura had drawn large quantities of water from the river during summer, and as the flow of the river had been diminished the seawater had encroached.

Canal of Little Murray Weir near Swan Hill (2004)



European settlement

1902

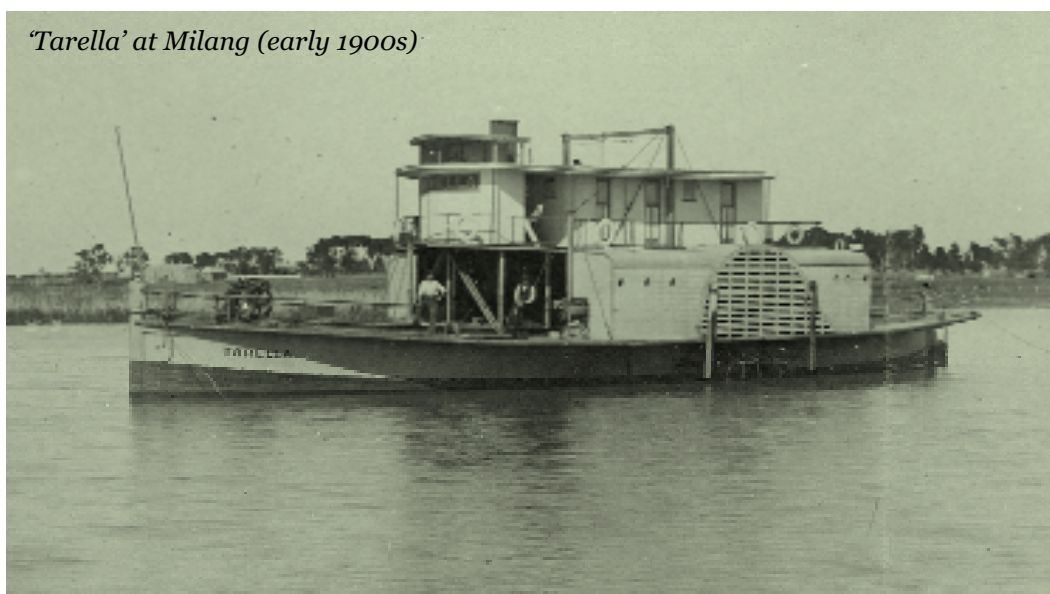
Mr Pearce, of the Bremer District Council, said that the effect of the salt water on herbage was already noticeable, and the winter floods were not sufficient to remove the salt deposited during the summer encroachments of the sea.

1902

29 May. The Southern Argus reported that at Milang *'The water in the Lake for some time now has been unfit for stock. It is salt and were it not for the bores which farmers and others had had put down stock would fare poorly'*.

1902

Southern Argus, 5 June. The Members of the Murray Waters Commission visited Victor Harbor and Goolwa in May to take evidence. At Goolwa after inspecting the wharf, they boarded the steamer Tarella, and accompanied by the Mayor (Capt. Ritchie, M.P.), Mr T Goode, J.P., and other leading residents, proceeded down stream towards the Mouth to inspect the sites for the proposed weirs.



1902

5 June, Southern Argus. The Murray Waters Commission when taking evidence regarding changes to Lakes Alexandrina and Albert visited the Angas family Point Sturt property. The manager Mr Nicholls informed them that he *'had been acquainted with Point Sturt for 12 years, and had noticed a great change in the waters of the lakes. The first serious trouble occurred six years ago, when he lost a number of valuable stock. He thought the drought was the cause of the saltiness of the lakes. Mr Angas had been forced to provide water paddocks, and if the lake continued brackish the water in the wells would probably be interfered with. The saltiness of the lakes had considerably reduced the carrying capacity of the country'*.

The commissioners also received evidence from Mr Allan McFarlane of Wellington Lodge. Newspaper accounts said that *'all will be agreed there is no-one on either bank of the Murray who is able to speak with more authority'*. Mr McFarlane told the Commission *'he had lived on the Murray since 1845, and had used the waters of the river for stock and irrigation. He was absolutely dependent on this source of supply, and had at great cost erected a tank capable of holding 30,000 gallons. Water pumped into this was conveyed six miles across his land. He had put down a number of wells but with no success. One bore he had put down to 179 feet. "Was the water salt?" asked a member of the Commission. "Salt" was not the word to call it, and Mr McFarlane replied emphatically – "Salt! Why it was a pickle!"'*



Point Sturt with Point McLeay in distance (2004)



Point Sturt (2004)

Looking along cliffs at Point Sturt with Coorong sandhills in distance (2004)



Southern Argus, 4 July. The East Wellington correspondent of the Southern Argus reported that *'The river here is merely an outlet for the sea, and the water is so salt that it is impossible to drink it when boiled. People living on the banks of the waterway who have no rainwater have to trust the generosity of their neighbours. There is no prospect yet of the river becoming fresh by summertime in which case it will be a sorry lookout for all stockholders who have no wells'*.

1902

24 July. The Southern Argus. *'The Milang fishermen were catching large quantities of mullet and very few cod because of the brackish conditions found in the Lake'*

1902

September. James William Jones, secretary to Commissioner of Public Works, Adelaide informed the Interstate Royal Commission on the River Murray. *'The areas of Lakes Alexandrina, Albert and the Goolwa, Finniss and Currency Creek channels, make up an aggregate of 192,000 acres of water surface, the shore frontage of which total 250 miles in length. The present depth at Milang is about zero of the gauge, RL 106.52 as compared with 110.75 of ordinary spring tides, and therefore from 2 to 3 feet below a proper navigable level, and instead of the water being fresh, as should be naturally, it has been either very brackish or as salt as the sea.*

1902

The disastrous results of the present state of the Lakes can hardly be exaggerated'.

18 September. It was reported in the Southern Argus, that at Milang, because of the unsuitability of the lake water alternative supplies were being sought. *'The water is so salt at present that no stock will touch it, and boring for fresh water is now being pushed on with all round, with varying success. Good water is generally found on the Milang side at about 100 feet, rising to within 10 or 15 feet of the surface. On the other side it is difficult to find it at any depth'.*

1902

Point Sturt towards Milang and Mt Lofty Ranges (2004)



1902

October. During the Suspension of Sessional Orders in the South Australian House of Assembly the Hon. G Brookman talking on the Murray Waters said. *'Lakes Alexandrina and Albert were almost salt. The reeds that used to grow around them had practically died.*

It would come as a surprise to most members to learn that Victoria had already constructed 2,000 miles of channels. One channel, or rather river, was 20 miles long and 110 feet wide, and he agreed with the Attorney-General that South Australia should immediately protest, so that it could not be said when the Royal commission had finished its labours that we had not objected to the Victorian works going on. What was happening in South Australia? Lakes Alexandrina and Albert were almost salt. The reeds that used to grow around them had practically died, and at the Murray Bridge station the water was so salt it could not be used for locomotive purposes'.

1902

16 October. Southern Argus carried an item in its General News section *'The Lakes'* in which it informed the readers that *'It is a very deplorable fact that residents of the lower Murray districts, and those on the borders of Lakes Alexandrina and Albert, do not more emphatically clamour for something being done to prevent the ingress of salt water at the Murray Mouth, for if prompt measures are not taken to deal with the evil, tens of thousands of pounds loss will result to landowners, and a prosperous district will be ruined. Apart altogether from the mischief which the lessening of supplies – from the diversion of water from the upper reaches of the river, and the decreased rainfall – has brought about by the shrinkage of the lake area, there must be considered the greater influx of salt water from the sea, the greater retention in the lakes, and the naturally increased duration of the salty presence in the lake water'.*

Point McLeay on left with Point Sturt in right distance (2004)



European settlement



23 October. An Adelaide newspaper The Register in an article on *'The Lakes and Point McLeay Mission'* said *'Mr F Garnet, Superintendent of Point McLeay Mission, reports the Lakes Alexandrina and Albert are still salting, and that the problem of how to obtain a sufficiency of water for the stock on the Mission and the neighbouring stations during the hot weather is a most difficult one. Although the feed is good it will be necessary for all to stock lightly and to spend considerable sums in digging out shallow soakage wells. Despite the long drought the waters of the lakes have always been sweet at this time of the year, and more or less through the hot weather so that their present condition is quite phenomenal. To the mission the salty condition of the lakes is a most serious matter, as apart from the above-mentioned difficulty it has completely stopped the washing of wool on the mission. Wool washing for the sheep stations in the neighbourhood has for many years found for about twenty natives steady and remunerative employment for two or three months every summer, the industry being quite self supporting. Its destruction means a loss of 200 pound per year to the natives. When the lakes were fresh there was considerable feed actually in the water, in the shape of waterweeds, but instead of being a source of food supply for the stock that now has become a nuisance and a disaster. It is rotting and smells badly and contaminates the air and water. Another loss to the mission is that the fish have been driven out of the lakes by the salting of the water'*

1902

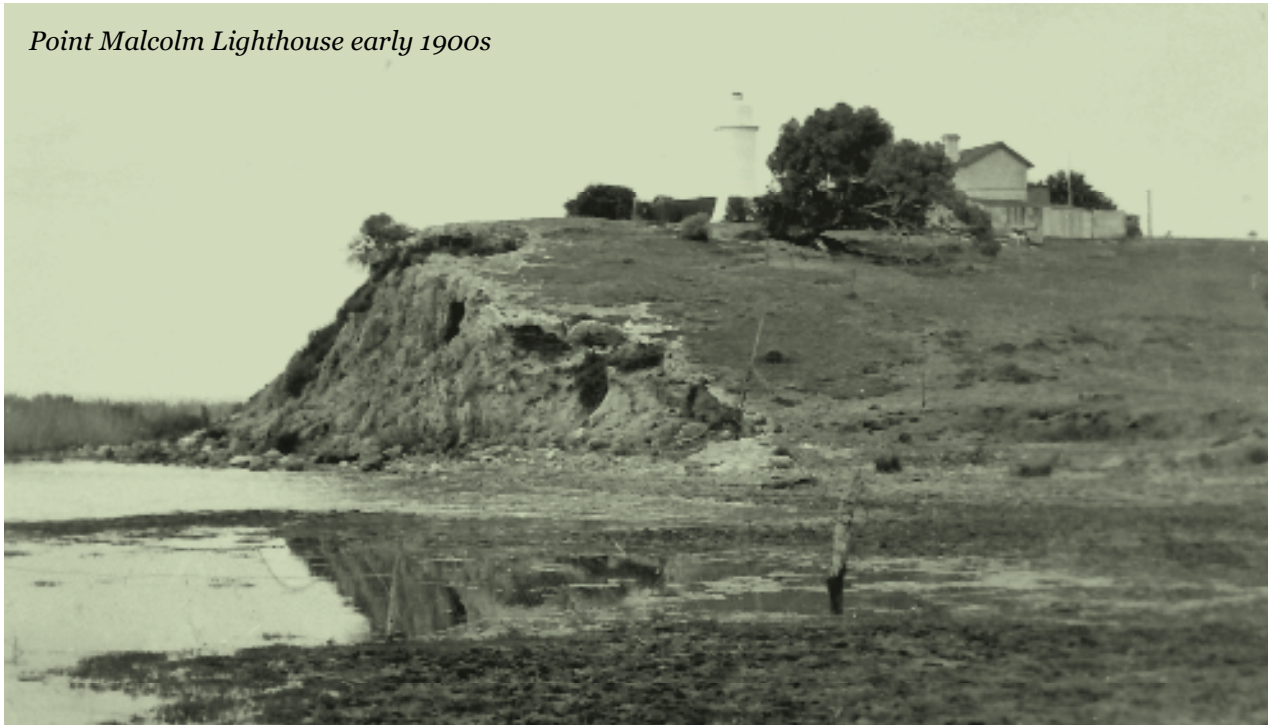


Drying wool after washing in lake (late 1800s)

Point Malcolm from ferry approach (2004)



Point Malcolm Lighthouse early 1900s



1902

November 27. The Southern Argus in its Milang News said *'Owing to saltiness of the Lake boring for water is necessary. Mr C Landseer put one down near the lake, water struck at 60 feet and it rose to several feet above ground. Pump and irrigation equipment was installed, pumping several thousand gallons per hour'*.

.....
1902

November 28. The Mount Barker Courier had an item in the General News section that said *'Successful Artesian Boring At Milang. A few years ago it would have been considered a sheer waste of money for anyone living at the Lakes to have put down artesian bores to secure a supply of freshwater, but, unfortunately owing to the usurpation of the waters of the Murray by Victoria and New South Wales for irrigation purposes, the flow of freshwater into the lower reaches of Australia's greatest waterway has not for some considerable time past been nearly sufficient to prevent the influx of sea waters through the Murray Mouth into the Lakes.'*

European settlement

Consequently, where previously there was an unlimited supply of beautifully fresh water, fit for almost any purpose, there is now only salt water, and stockowners and agriculturists are forced to bore for supplies of freshwater to meet their requirements. One of the most successful bores at Milang is that put down within the past week or so by Mr AH Landseer, who was fortunate in tapping a splendid flow of clear perfectly fresh water. At a depth of about 60 feet rock was struck, but after boring another 7 feet the water welled up with a rush and a roar, and in less than a minute the well was half full. The large stream made its way to the lakes, but the tubing was soon withdrawn, and even after the last length had been got out, the water sprang up like a fountain. The engine was then brought to work, pumping a full supply first onto the bush around and then onto the lucerne, and although this was kept up for some time the water was not lowered by one inch. Mr Landseer's description of the artesian flow is, "Fresh as day and clear as crystal," and the stream can be cut off or turned on to the full as circumstances necessitate. Writing under date 26th inst. Our Milang correspondent says: - "The water continues to flow strongly from the 3 inch pipe and spouts up 3 feet above the level of the ground. A powerful steam pumping plant in two hours working failed to lower the supply to any noticeable extent. From a bore on the property of Mrs Goldsworthy the water from a depth of 80 feet, also rose above the surface and ran away in a strong stream to lower ground. The water in the Lake is quite salt, and other bores are now being put down with the hope of securing a permanent supply of freshwater."

.....

January 23. In an editorial on Water Conservation the Mount Barker Courier said in part, 'In not a few instances landholders have had to put down wells to secure a supply of water for domestic and stock uses, and this too, where hitherto there has been an unlimited quantity of beautifully fresh water in the lakes'

.....

January 23. Milang News section in the Southern Argus had an item on water at Milang. 'A splendid supply of water was struck last week by a bore put down near the railway station. The water, which is to be used for public purposes, will be conveyed by pipes to suitable places about the township. The water is quite fresh, and spouted up a foot above the ground'

.....

19 February. The Diversion of the Murray Waters – Mr J Cowan MP, of Murray Bridge is arranging for a monster deputation to wait on the Government on March 7th, at 10.30 am, to support the Government in protesting against the action of Victoria in trying to divert and unduly make use of the Murray and the tributaries to the detriment of navigation etc., and to urge the Government to construct a barrage at the Murray Mouth.

The South Australian Government has intimated that it is their intention immediately the House meets to introduce a scheme providing for the construction of barrages, or for the prevention otherwise of the influx of the sea at the Murray Mouth channels. The promise is tantamount to the guarantee that the desirable works will be promptly proceeded with, for there was such a unanimity of opinion amongst the large party of legislators which recently visited the Mouth as to the absolute necessity for prompt measures being taken to prevent the devastation of properties on the lakes and lower river shores by the permanent salting of the waters through the influx of the sea, that that there should be little difficulty experienced in obtaining the necessary legislative sanction for the proposed works. So fully has the importance of the matter come to be recognised, that the Government might safely take it upon themselves to have the sites of the proposed barrages and causeways properly surveyed, and definite data as to the cost secured, so that the fullest information could at once be placed before Parliament, and dangerous delay be avoided.

Milang jetty
(early 1900s)



1903

The Murray Barrage. The Engineer-in-Chief (Mr AB Moncrieff), accompanied by Mr TW Keele, the Principal Engineer of Harbours and Rivers in New South Wales, and MR W Davidson (Inspector General of Public Works in Victoria), paid a visit of inspection to the Murray Mouth in April. They proceeded as far as Pelican Point, and examined the various sites at which it is proposed to place a bar. A joint report on this scheme was forwarded to the Commissioner of Public Works (Hon. RW Foster). In the House of Assembly the Premier, in reply to Mr McDonald, said that he had received the report of the experts relative to the construction of barrages at the Murray Mouth, and he would lay the report on the table. The estimated cost was 113,000 pound. The original estimate for a barrage at the Murray Mouth was 51,000 pound – subsequently this was increased by 61,000 pound.

In the opinion of many lakeside settlers all that is required is a single barrage at the mouth, which would check the inrush of the saltwater and thus make the Coorong fresh. The summer level of the River Murray above sea levels (ordinary low water spring tides at Victor Harbor) are as follows: at Goolwa 6 inches, Milang 1 foot, Murray Bridge 1 foot, Mannum 1 foot, and Morgan 2 foot 4 and 1/2 inches. When the proposed barrage at Goolwa is completed, and at times of summer level of the river the respective levels above low water sea, as given above will be increased as follows; – Goolwa 3 feet, Milang 2 feet 6 inches, Murray Bridge 2 feet 6 inches, Mannum 2 feet 6 inches, Morgan 1 foot 1 and a 1/2 inches.

1903

26 February. Southern Argus. Contained an Editorial, The Influx of The Sea, telling about a large Parliamentary party who visited the Murray Mouth to inspect why and how changes had occurred and see the importance of preventing the influx of the sea into the lakes.

The issue also had an article on the Lakes that in part said .. *Through the joint influences of long continued drought and an increasing diversion of its waters in its upper course, the River Murray has so steadily lowered its levels that its lower reaches and the lakes which for centuries it had supplied with a constant flow of fresh water, have fallen to sea level, with the result that instead of the river 'rushing out to sea' the tides of the ocean have flowed in, changing the freshwater lakes to salt ones, and carrying the ocean waters so far upstream that as far as Murray Bridge it is 'salt as the sea'. The effects of this change have been disastrous to residents on the shores of the lakes and on the banks of the stream, the cutting off of supplies of freshwater very materially affecting stockbreeders, and thus deteriorating land values. Already heavy*

expenditure has been incurred in the sinking of wells and artesian bores to provide water for stock, while the destruction by the salt water of the reedy growths, which in summer formed valuable fodder has considerably reduced the carrying capacity per acre of the lake frontages. Hitherto the foreshores, and the shallow flats have been covered with rich vegetation which was eagerly devoured by cattle and sheep in the dry months, but the reeds and succulent growths have been almost all destroyed, and instead of rich pastures margining the waters, a salty, sandy beach is gradually forming on which marram grass alone will grow. The residents of the districts affected by this changed order of things have naturally been alarmed for the future, and now that there are proposals by Victoria and New South Wales to undertake irrigation works from the upper river which will enormously reduce the downflow of water into the Murray, they are up in arms to protest against such proposals being carried into effect. Happily the Government of South Australia have been awakened to a sense of the extreme importance of the rivers question beyond its mere parochial aspect, and the vigorous protests of the Attorney-General against the infringement of South Australia's rights in the matter carries conviction that our government will fight to the bitter end to prevent a gross breach of states rights, and of riparian law being sanctioned. The pity of it is that the Parliament of this state did not years ago appreciate the river trade and its possibilities at true worth; had the importance of the river been properly estimated the difficulties which have now to be faced would have no existence, navigation on the river would have been constant and ever increasing, and our geographical position been made fullest use of. The "what might have been's" of history, however, too often bring out sighs of regret, albeit they form object lessons for a future. Just now South Australia mourns her lost opportunities, but buckles on her armour and prepares to profit by the experience of the past

.....

February 27. In the Mount Barker Courier article on 'Locking out the Sea' it explained that 'A few years ago the water was rarely known to be salt even as far up as Point Sturt.

The displacing of the freshwater by salt has proved fatal to the luxuriant growth of reeds and other herbage which previously fringed the lakes and river, while in not a few instances settlers have lost large numbers of stock and had their wells spoilt

March 5. The Southern Argus in a General News article 'Bore at Milang' told why the bore was necessary. 'Messrs W and H Dunk having been given a lot of worry and trouble of late in the working of their steamers through the damage done to the boilers by the salt waters of the lakes. Mr WP Dunk determined to put down an experimental bore at the far end of the Milang jetty. A 12 feet 6 inch iron pipe was first driven down through the mud to nearly high water level and then a 4-inch bore carried down for 68 feet and cased in iron piping. At this depth a strata of hard rock was encountered, the seam running about ten feet in thickness. Immediately this had been pierced water gushed up, so the bore was carried a foot or two lower, by which time the artesian water – beautifully clear and sweet – had risen to about three feet above the level of the Lake, at which point it continues to stand, despite the fact that the supply has already been heavily drawn upon'.

.....

12 March. The Rivers Question. "The deputation which waited on the Premier on Friday morning last to uphold the Government in their action in demanding due recognition of South Australia's right in the settlement of the River's question, was, as far as its personnel, and the representative nature of the interests concerned, an unqualified success, and should materially strengthen the Ministry in insisting on the riparian law being fully and impartially administered, and, further, convince the sister states that South Australia protests with no uncertain voice that she will not allow her just and lawful claims to be either ignored or set aside." The deputation represented all who were dependant upon "maintenance of the supply of Murray water".

1903

Delegates from the Chamber of Commerce, the National League, the Commercial Union, the Manufacturers and Producers, and the Labor Party followed in similar strain, a consensus of opinion being evidenced that a direct appeal should be made to the Privy Council to prevent proposed extensive diversions of the up river waters being made in Victoria and New South Wales.

1903

April 16. The Sydney Daily Telegraph reported on the unusual fact of Garfish being found in Lake Alexandrina because of the saltwater conditions. The article said that these conditions had also had an affect on *'Hindmarsh Island which used to support large herds of cattle on its succulent reedbeds, has been turned into a saline waste, and similarly valuable property is being rendered useless by the salt water'*

1903

14 May. Kapunda Herald contributor *'Timoleon'* says in an article on The Murray Waters. *'Blessed is he who expected nothing, he shall not be disappointed. Is not that the position today regarding the River Murray question? Those who have worked hard to bring about an equitable solution of the problem, who had some faith in their neighbours, and a belief that we had joined a federation for the purpose of getting fair play, expected a settlement on broad lines. They have not obtained it, and are disappointed. When Victoria and New South Wales began drawing upon the waters of the Murray and its tributaries there was only one honest course for them to pursue, cooperate with South Australia in order to protect the latter and make their own position more secure. South Australia asked for a system of locks. Representatives of the Commonwealth Government agreed that was the solution of the difficulty. A body of experts after exhaustive enquiry agreed, and added that storage basins were necessary to catch and hold floodwaters. But at the Premier's conference in Sydney last week there was a solid majority against spending money on locks. One proposal after another on behalf of South Australia was knocked over. The final agreement was to parcel out the water over a period of five years – this and nothing more. This falls far short of what South Australia wanted, and what we have a right to expect from New South Wales and Victoria and from the Commonwealth. We were told by federalists that the constitution provided for the "control of navigation" that only a "reasonable use" of the waters of the rivers would be permitted, and that every possible provision would be made to allow "free interchange of commerce within the Commonwealth" State representatives not interested in the river question – Western Australia excepted – would not hear of the Commonwealth spending any money to improve navigation of the rivers and they combine with Victoria to prevent that ! A splendid federal spirit amongst the "one people with the one destiny!" Then Victoria "wouldn't listen" to the three states combining to share the expense. "We really can't afford it," said her representative. So South Australia had either to agree to an apportionment of water, or nothing, and face all the risks involved by going to law. The division is more favourable than that recommended by the Royal Commission, but then the appointment of the experts was subject to the construction of locks and storage basins. Perhaps the most disappointing feature about the whole thing is the apathy of the Federal authorities and the indifference of some of our federal members and the opposition of others. One senator, for example, has been heard to say that "navigation is all humbug. Irrigation comes first and is the only thing worth troubling about." He makes no secret of his opposition to the South Australian view on the river question. And this selfsame senator may be one of the three members of the interstate commission! Poor South Australia! There are other members who "take no interest" amongst these Mr Kingston, "our only Minister" is supposed to rank. He has not uttered a word or moved his little finger to support this state in its fight for riparian rights. Is it any wonder that with the combined opposition of other states, the*

European settlement

indifference of the Federal Government, and a division in our ranks that South Australia stands a good chance of being “knocked out” over the river question. So far federation is not proving all that it is cracked up to be, excepting for those who have got into high places and correspondingly high pay’

October 1. Southern Argus carried an item on ‘*The Murray Barrage Question*’ and explained that ‘*One of the problems the local State is endeavouring to unravel is how to keep the saltwater out of the lakes, and if this were the only question the solution would be comparatively easy, but New South Wales and Victoria with their diversions are threatening to cause the sea, which pushes forward as the freshwater recedes and becomes weaker, to supersede the lakesiders as occupiers of the soil.*

Serious attention must be given by South Australia to this all-important question, and as a large monetary outlay is require she will do well to act wisely and judiciously. Engineers from the three chiefly interested States, after contemplating the difficulty, decided that five erections would be necessary to keep back the encroaching seawater, and provisions for storing enough water in the lakes to allow for summer evaporation and the contemplated diversions by New South Wales and Victoria’.

The Royal Commission into the River Murray was tendered the following evidence by landholders about the Lakes.

Ritchie: *Salt as far Pomanda since upstream diversions. Salt felt upstream for 40 miles (from Murray Mouth) for last 2 or 3 years. Only to Point Sturt (16 miles) before this.*

Wolter: *Salt as far as Wellington (at times) in past, more frequent now. He believes it did not go past Wellington.*

Newell:(Fisherman). *Follows saltwater as far as Wellington, but in former years only to about Point Sturt. To Point Pomanda in last 3 or 4 years. Salt came only in dry portion of year. Saltwater fish to Port Agnes and Brinkley. Cod to about Point Sturt.*

Nichols (manager of Angus’s Point Sturt estate): *First trouble (with saltwater in 1896) salt in 1895 to certain extent. Pre 1896 no wells. Salt caused by drought. Since ’96 provided wells in all paddocks. Salt killed reeds, Mr Oakley next door can only keep 1/3 number of stock.*

Bowman, Campbell House, Bakers Peninsula: *Been there 27 years. Believed lake never too salt for stock. Lake because of low level ‘letting’ in seawater. Coorong now salt, but he has seen it fresh to McGrath Flat.*

Hackett, Point McLeay (Narrung Station): *35/36 years. Last five years great distress because of saltwater. Been getting salt for about last 10 years, last 5 or 6 more noticeable.*

Williams Jabez, Meningie: *Salt in last 5 or 6 years.*

Landseer AH, Milang: *Lakes now saltier. Been getting worse the last 3 or 4 years.*

Rogers George Viney, Mail steamer to Meningie from Milang: *Last 40 years.*

Saltiness increased in late years. Four or five years ago Lake water used for drinking now its not.

Garnett Francis, Superintendent Point McLeay: *In recent years had to put wells in near Lake for drinking water. Before up to 300 people relied on Lake water.*

McFarlane Alan, Wellington Lodge since 1845: *Freshwater all the time. Sends water from lake (river) 5 and 3/4 of a mile inland. Twenty-five or 30 years ago fresh all the time.*

Premiers’ Conference, Sydney, for first time other States admitted that South Australia had an interest in the Murray. Allocated 150,000 cubic feet of water to pass the border.

1904

13 May. Mount Barker Courier reported that in March 1903, *‘Victoria was taking fully 75% of the water of the upper Murray and the Goulburn, or a total of 103,000 cubic feet per minute’.*

.....
1904

19 May. The Murray Waters. *“To none of the States of Australia does the possession of a full Murray mean more than to South Australia, says the “Southern Cross.” Fortunately, it does not appear probable that the river will get down so low as it was last year for a long time to come. The cycle of droughts has been broken, and heavy rainfalls on the watershed of the stream mean a good flow of water. Still the state to which the Murray was reduced in the time of greatest dryness shows how important it is that South Australia should be alive to its interests in this matter, and should not allow New South Wales and Victoria to deal with the contents of the river as though no-one else has any proprietary rights in them. Even with a comparatively primitive system of irrigation on the upper reaches of the Murray and its tributary streams the drought so curtailed the volume of water flowing past the South Australian border that navigation was impossible, while the seawater found its way not only into lakes Alexandrina and Albert, but right up to Murray Bridge, with the result that pasture lands were impregnated with salt, and the waters near the margins of the lake was rendered unfit for stock. It is to guard against the recurrence of such disquieting events that the construction of a barrage near the Murray Mouth has been mooted; but it does not appear at all certain that the work will be undertaken except under pressure of another emptying of the stream’.*

.....
1904

8 July. Mount Barker Courier reported that the Prime Minister believed a central body was needed to control the Murray. He therefore asked New South Wales, Victoria and South Australia to give control of Murray to Commonwealth -Victoria said no.

.....
1904

29 July. Mount Barker Courier. G Ritchie, Member for Alexandra notified that he would move that Victoria be restrained from instigating the Tooleybuc Irrigation scheme.

.....
1904

31 August. House of Assembly. The Murray River.

Mr Ritchie, quoted from a letter by Mr WR Randall, a late member of the House, who wrote on June 3 *‘To show the effect on the lower river that these diversions have already made, I would point out that during last summer the Murray, Murrumbidgee and Darling were all in fairly high flood, and that they all came down together; and from observations I have made I feel justified in saying that the Murray from Morgan downwards would have been from 18 in to 2 feet higher than it has been but for those diversions. The injury already done was nothing compared with what they might expect in the future, if the upper States were allowed to go on diverting the waters as they were now doing, or to the extent proposed works suggested’.*

.....
1904

October 6. In a letter to the editor of the Advertiser Chas H Angas of Lindsay Park, Angaston said he also has land at Point Sturt and as such is in favour of a barrage to keep out the seawater. *‘At present the reeds, most valuable feed for cattle in the summer, are gradually dying out’.* *‘Three years ago we went to considerable expense in putting down a large plant for irrigation but have seldom been able to make use of it when required in the summer months owing to salt water, although it is not on the sea side of Point Sturt’.*

.....
1904

October. The following information was read in the South Australian Parliament during the Murray River Barrage Bill debate. *‘Mr Hackett, who had 40 years’ experience on the Murray wrote as follows – “The natural condition for the last 40 years of my own knowledge – if I except the last year, which I admit, was affected by the drought, but was intensified by diversions – was a sufficient supply of fresh water to meet the*

European settlement

requirements of settlers for their stock, and any divergence from these natural conditions is a direct infringement on the riparian rights which have been in existence for half a century'

Mr Pearce, another very old settler, wrote as follows 'There is every prospect of another low river, which also means the inflow of salt water, as there will not be sufficient fresh water coming down the river after the end of the year to keep the sea water back, and the result will be seen in the lower Murray and Lakes Alexandrina and Albert being filled with sea water. This would be most disastrous to stockowners and dairy farmers who have the river or lake frontage. Swamps which were a few years ago good feeding ground for summer purposes have since been impregnated with salt and become useless. Having land on both the lower Murray and Lake Alexandrina I can speak with authority. Any one accustomed to stock knows what ill effects this change of water has on them; and considering the thousands of sheep and cattle bred in these districts we need some protection against the loss of stock, as it is impossible to keep many without the frontage'

.....

Murray Barrage Acts (number 873) was passed to prevent the influx of the seawater to the river. Consisted of a solid structure to RL 109. Rates were to be levied on land between 1/4 penny to 1/2 penny in the pound. (Act never put into operation).

Parliamentary party inspect barrage sites in April.

The Murray Barrages. *Meeting at Milang. Strengthening the hands of the Government. A meeting was held at Milang on Thursday to discuss the proposal of erecting barrages in the vicinity of the Murray Mouth.*

The outcome being the following resolution " 1 That this meeting of landholders on the River Murray and Lakes Alexandrina and Albert urge the Government to proceed with the work required to control the inflow of salt water into the lakes basin by the construction of barrages in the Mundoo, Ewe Island, Deep Creek and Tauwitherie channels before undertaking the erection of that across the Goolwa channel.

2 That this meeting joins heartily with the River Murray League in urging on the Government to take immediate steps to obtain consideration and recognition by the Federal Government of the rights of South Australia in the waters of the River Murray."

Murray Barrage Bill before House of Assembly in South Australia. The Act 'provides for a series of five weirs from Goolwa to Pelican Point, connecting the intervening islands. Work to be carried out by contract and not to exceed one hundred thousand pound. The weirs from Hindmarsh Island to Pelican Point to be authorised to be constructed forthwith, but that from Goolwa to Hindmarsh Island, though approved by the Bill, not to be constructed until Parliament so decides by resolution. Those from Hindmarsh Island to Pelican Point not to cost more than fifty eight thousand pound, Goolwa to Hindmarsh Island to cost not more than forty two thousand pound. A clause provides for tolls being demanded for the use of the barrage. The work is to be carried out under the betterment principle.

Part two of the bill sets out a system of rating. A plan of the lands deemed to be benefited has been prepared, and of the lands liable to rates an assessment based on the unimproved value is to be made each year by the Commissioner of Public Works, and for this purpose he is to be given access to the assessment books of the Commissioner of Waterworks and any municipal corporation or district council concerned. Certain lands are to pay a tax of halfpenny per pound, and others a farthing (1/4 pence) per pound.

Part three provides for appeals against an assessment and part four sets out the process for recovery of rates, power being given to the Commissioner to let or petition the Supreme Court for an order to sell any land on which the rates remain unpaid'.



Milang jetty (early 1900s)



1905

At a September meeting in Murray Bridge, on barrages and their effect on reclaimed swamp land, landowners made it known that they did not want barrages for fear that they would cause reclaimed swamps to flood. During this meeting a Mr Jaensch said that salt water has never got to Murray Bridge.

1905

Mr Moncrieff was asked to prepare a comprehensive scheme of improvements for the River Murray. It was to include construction of such defences against seawater as might be necessary to keep the Lakes fresh.

1905

9 February Southern Argus. The Murray Barrages. *'Each succeeding year's experience of the inconsistency and irregularity of water in the Murray and Darling, with the consequent fluctuation in the level of the lakes at the outlet, and each succeeding year's increasingly mischievous invasion by seawaters of the lakes points to the urgent need there is for proper conservation and preservation fresh of the vast quantities of water which year after year are allowed to flow wastefully to sea at the Murray Mouth. To South Australians, particularly to those resident in the vicinity of the lower reaches of the great waterway, and on the shores of the lakes, the matter is one of infinite concern, the free navigation of the rivers and the purity of water determining to such a great extent the prosperity of the latter, and in view of the irrigation schemes Victoria and New South Wales are projecting nothing should be left undone to induce the Federal Government to deal with the matter in a thorough way by providing for the upper rivers a series of locks, and for the Murray Mouth a properly devised weir. The cost, it is true, would be heavy, very heavy, but the resulting gain to the three states concerned would be sufficiently great to speedily if indirectly provide high interest on the outlay by establishing prosperous settlements all along the riverside country, and keeping fleets of steamers constantly plying. The work will eventually have to be effected – that is certainly – and it would be to the interest of New South Wales, Victoria and South Australia to have it effected without delay; but Australian politicians are such slow movers, so procrastinating in their public works policies, that it is very unlikely that they will sanction such an extensive undertaking as the one outlined till absolutely forced to do so.'*

Meanwhile, the construction of the barrages at the outlet of the Murray should be proceeded with at once, the lowness of the rivers at the present moment, and the unchecked flowing into the lakes of the saltwater from the sea, menacing all property holders along the shores and lower rivers, and demonstrating the extreme urgency of

the need for preventing this influx of the sea. The danger threatening is a very grave one, and we very earnestly advise the people interested to sink any little differences of opinion they may hold, and make a strong appeal to the Government to push on with the work at the earliest possible moment’.

1905

2 March. The Southern Argus explained that a problem was being experienced at Goolwa with the wells that had been dug to provide water because of the changed conditions to the water in the Murray. *‘Many of the wells in the neighbourhood are giving out and it is believed to be connected with the saltwater’.*

1905

31 March. The Mount Barker Courier in its column ‘Milang News’ said *‘The Lake is rapidly becoming salt. Fortunately the landholders adjacent have a plentiful supply of water from the bores put down two years ago’.*

1905

21 September. During a Motion for Adjournment in the South Australian House of Assembly on the Murray Waters. Mr Ritchie informed the house that *‘ With respect to the navigation period, one of the recommendations of the Royal Commission was that the period should be seven months out of the year. That opinion seemed to be shared in by a great many people who took an interest in the question, and it seemed to be accepted as the correct principle. When he (Mr Irvine) gave evidence at Goolwa he handed in a statement of certain periods when the river was navigable for a much longer time. The return was for 19 years, from 1886 to 1905. It should be evidence strong enough to convince the most sceptical. In 1886 they had a period during which navigation was open on the Murray from its mouth to Wentworth of five months; 1887, 12 months; 1888, 12 months; 1889, seven months; 1890, 12 months; 1891, 12 months; 1892, 10 months; 1893, 12 months; 1894, 12 months; 1895, 12 months; 1896, 11 months. Taking the period of eight years it was below 12 months only on three occasions, and those three were 7,10, and 11 months respectively. In 1897 it was six months; 1898, eight months; 1899, seven months; 1900, eight months; 1901, six months; 1902, one month. The last named was an exceptionally low year, such as had never before been known in the history of the country. In 1903 the period was six months, and last year the Murray was navigable for 12 months. For 19 years the average period of navigation was a little over nine months every year, so that the statement about seven months was entirely without foundation.’*

1905

2 March, Mount Barker Courier. The Premier of South Australia (Hon. T Price) inspected the sites of the proposed barrages on Lake Alexandrina and during the evening addressed a meeting at Goolwa..

1906

Paper read at the July 5th 1907, meeting of Victorian Institute of Engineers by Thomas Walker Fowler. Suggesting ways of keeping the Murray Mouth open for navigation. Problems were being experienced at the time, with the river mouth, because of low flows in the Murray.

1907

The solution he believed was that a channel needed to be cut through Younghusband Peninsula seven or eight miles southeast of present entrance.

The channel would need to be one thousand feet wide and thirty feet deep. This would give a tidal range of one foot over the 224 square miles of Lake Alexandrina. This would also mean 6,000,000,000 cubic feet of water would pass and repass through it at every tide.

28 March. The Southern Argus section on Local news included the following *‘Messrs Ross Bros., of Milang have been very busy lately well boring, and their new plant has worked very successfully. Since the beginning of the year they have drilled about eight*

1907

1907

wells, and in all cases secured supplies of good water, viz. on the properties of Messrs Griffin, Metcalf, Oldfield, Cheriton, Colebatch, Borrett, Verco, and Ferguson. Next month they start a new contract for Mr K Bowman at Poltalloch'

1909

11 February, Southern Argus. Goolwa. 'The river here has fallen considerably lately, owing to the last rise having just about all run out through the Murray Mouth. Consequently the salt water has again made its appearance and so we are reminded of the fact that an effective system of locks and storage basins should be carried into effect and some means devised to keep the saltwater back'.

1912

11 April, Southern Argus. An Editorial in the Southern Argus, 'The River Policy', decried the fact that nothing has been done to protect the Murray for navigation etc even though it has been advocated since the Southern Argus began in the 1860's. 'But meanwhile the river is being so drained by irrigation works that its level is so steadily sinking that the lower stretches are becoming almost tidal, and the sea water is finding its way far up stream, so sluggish is the current opposing it. Lakes Alexandrina and Albert have been robbed of their value and character to a very great extent, and become a menace instead of a rich asset to the people resident on their shores, and unless barrages are put down there is prospect of each year finding conditions worse and worse. Hence it is still more desirable that the state of things now complained of with regard to the inflow of seawaters to the lakes through the depleted river shall be at once attended to.

4 June, Southern Argus. Mr AA Fullarton writing from Nalpa under date May 30 says – 'The lake and river water as far as Wellington is quite clear and very blue. At Nalpa jetty it is salter than I have known it to be since all the beautiful willows were destroyed by salt. This shows that the sea has again invaded the lakes, and it is further proof of the necessity of some means being taken at the Mouth to prevent the freshwaters of the lake being spoilt'.

Narrung Jetty
1913



1914

22 October, Southern Argus. The Murray Barrages. 'For several years the influx of salt water into the lakes has been a source of great anxiety to the landowners on the shores of Lake Alexandrina and Albert, and has formed the subject of frequent deputations to the Government without any tangible results.

The prevalence of dry years and the enormous demands made by the States of New South Wales and Victoria on the waters of the Murray and its tributaries to fill and replenish their ever increasing storage basins have been factors in a material addition to this salt water trouble in our lakes. During many months fishermen have been taking salt-water fish from the lakes at Pt Pomond, testifying to the good foundation of the complaints made from time to time'.

European settlement

A proposal was made to construct a barrage across the Mundoo channel. This was expected to prolong freshness of the Lakes. It was to be a solid structure (sandbags) with a small sluice.

'The erection of a barrage is being undertaken across the Mundoo Channel, between Hindmarsh Island and Mundoo Island, with the object of keeping back the main current of salt water that rushes through the Murray Mouth and along the channel to the Lakes. The work is well in hand, and it is expected it will be completed before Christmas. The barrage is being built on top of a reef that crosses the channel, and is awash in places at low tide. The rocks form a ledge about 12 feet in width, with deep water on either side, and about 600 feet in length, and the embankment will be only a few feet high, as the current is not strong enough to disturb it. Sand is tied up in new bags, and the bags are piled on top of one another on the rock. Thousands of them will be used, and the obstacle will remain there for years. During its existence careful observations will be made as to the effect of blocking the channel and if the scheme works satisfactorily the Government may be disposed to erect permanent barrages across four shallow channels between the Coorong and the lakes' Mount Barker Courier. (After construction there was pressure from the settlers between Wellington and Murray Bridge to have it removed because of fears that it would cause the reclaimed swamps to be flooded. Consequently, it was removed by being blown up. It was replaced soon after with a timber structure with gates. This was undermined during a big storm and it was not repaired.)

Engineer in Chief and Director of Agriculture in a joint report recommended construction of barrages on all the channels except the River Murray (Goolwa channel?)

12 February. The Mount Barker Courier described the Mundoo Barrage in an article entitled *'Scene Visited By Settlers. A Memorable Gathering'*. It said that *'A barrage is being built of bags, filled with sand, as an experiment from Pelican Point to the channel between Hindmarsh and Mundoo Islands, linking up the smaller islets intervening so as to form a break along a natural rocky barrier which will keep the sea back. Even then the salt water would come up through the main channel past Goolwa, but people are hopeful, if a barrage can not be constructed there, that the course will be less harmful than the inrush into the lakes through the more direct routes. The barrage is about 350 yards long, 34 feet wide at the bottom, and 10 feet broad at the top, while there are sluice gates in the middle.'*

'The work is about two thirds complete'.

Agreement between 3 States and Commonwealth to construct storage locks for irrigation and navigation and to improve provision affecting this State, (1) South Australia to have use of Lake Victoria as a storage reservoir, (2) To protect settlements along Murray from salinity.

Up to date New South Wales has used very little of quota but it is launching into a very large scheme, whereas Victoria is fast approaching her quota.

2 April. The Mount Barker Courier had an item on saltwater at Mannum saying that it was *'caused by seawater coming through the Murray Mouth. The water has never been so brackish. A most remarkable factor however is the presence of freshwater about 8 mile above the town continuing to near Purnong a distance of about 20 miles after which it was again quite salt. The brackishness of the upper river is caused by salt springs and not the sea'*

12 November. The Mount Barker Courier East Wellington correspondent informed the readers *'The river is beautifully fresh and it is also high, but the willows are practically all dead, only one here and there being alive. This of course, is the result of last years saltwater'*

1916

1914 report on barrage construction was referred to Major Tolley and he recommended a barrage construction also, but construction of a barrage between Wellington and Lake Alexandrina, because 'they' knew that they had a claim under the River Murray Agreement that the Murray above Wellington would be kept fresh. However tests proved that construction of this barrage was almost impractical. It was still mud to a depth of 60 to 70 feet. As well as the works being open to the prevailing winds across Lake Alexandrina it would also be costly.

It was possible to build barrage at Goolwa to serve purpose required to regulate flow of river and keep the Lakes fresh by curbing inroads of seawater. *'Which was undoubtedly becoming worse and would become worse in future as diversions in the River upstream increased'*.

Letter from the Premier of South Australia to other Premiers. *'River Murray Act 1915, this State faced with very serious problem in connection with maintenance and supply of freshwater to irrigation between Mannum and Wellington and the Riparian Rights of the settlers on Lakes Alexandrina and Albert and Coorong. This agreement was almost entirely based on data contained in Report of the Interstate Conference of Engineers 1915. It left out maintenance of flow into Lakes but had provision of maintaining channel of River fresh. It was estimated that 47,000 acre-feet per month was needed, this was actually 36,000 acre -feet per month after deducting losses in Lake Victoria.*

Releasing 72,000 acre feet per month from Lake Victoria would raise level at Wellington by two to three inches. But westerly or south-westerly winds in Lake Alexandrina would bank river up at Wellington and has done so to at least three feet three inches. This causes a strong inflow of seawater and this has been known to reach as high as Murray Bridge.

The combined area of Lakes is 200,000 acres, evaporation during months of January to June three feet. Total lost to evaporation 600,000 acre-feet. The cost of stored water is one pound per acre-foot, so cost of maintaining water for evaporation in Lakes is prohibitive.

Mount Barker Courier reported that the Mundoo barrage is to be demolished because it is keeping back too much water and it is also allowing the Murray Mouth to silt up. The Mundoo barrage is believed to be the cause of high water up to Mannum because as it is the shortest channel it is the natural outlet for the flood-waters'.

.....
1916

.....
13 January, Southern Argus. Goolwa correspondent said *'The Mundoo barrage will make practically no difference to the seawater, though a little fresh water may be impounded for a very short period'*.

.....
1917

.....
17 May. River Murray Outlet. Major Johnston's Report. As a result of his investigations in South Australia into the problem of an outlet for the produce of the Murray River and lands, Major EN Johnston, of the Corps of Engineers, United States Army, has forwarded to the Government a highly valuable and comprehensive report, embodying several alternative and tentative schemes for harbour development. The report if printed, would make a bulky volume. It goes minutely into the various suggestions brought under Major Johnston's notice, and is accompanied by plans and drawings for use in giving effect to any of the schemes. The engineer has based his estimates on data given supplied by the railways standing committee for a future possible commerce of 448,000 tons, and also upon an immediately prospective commerce of 114,000 tons. The report is dated Galveston, Texas, November 20, 1916.

The schemes which have been reported on by Major Johnston are as follows.

1. Improvement of the Murray Mouth and construction of a harbor inside the mouth. Estimated cost for 1,200 feet of berthage, 719,500 pound.
2. Improvement of the Murray Mouth and excavation of a ship canal to Goolwa. Estimated cost 852,000 pound.

3. The construction of an open wide ship channel through Sir Richard's Peninsula, with harbor at Goolwa. Estimated cost, 737,000 pound.
4. The construction of a narrow locked ship canal through Sir Richard's Peninsula, with harbour at Goolwa. Estimated cost 698,000 pound.
5. Channel from Goolwa to River Murray above Lake Alexandrina, including channel from Encounter Bay to Goolwa. Estimated cost 1,541,000 pound (exclusive of dredging above Wellington to afford a ship channel to Murray Bridge, which would render unnecessary the construction of railways from Monarto, Murray Bridge, or Taillem Bend to Sandergrove).
6. Reclamation of Lakes Alexandrina and Albert, as incident to scheme 5. Estimated cost of dyke and embankment, 727,000 pound.
7. Barge canal from Goolwa to Victor Harbor, and improvements at Victor Harbor. Estimated cost 644,000 pound.
8. Exclusion of salt water from River Murray above Lake Alexandrina.

The general summary of costs of the various schemes of improvement, allowing for 3,600 feet of berthage, instead of 1,200 feet as provided above, is as follows :- No.1, 910,000 pound; No.2, 976,500 pound; No.3, 861,500 pound; No. 4, 822,000 pound; No.5, 1,631,000 pound; No.6, 2,358,000 pound; No.7, 969,500 pound.

In conclusion, Major Johnston says; - *"If it is assumed that a large harbor will be required, there are many points in favour of Goolwa, as against Victor Harbor. If the Government of South Australia is satisfied that there will be a large commerce seeking an outlet in the vicinity, I would recommend the Goolwa improvement as in scheme No. 3. If, however, the Government believes that the commerce will not exceed 448,000 tons, and may not reach that amount, it would seem that the improvement of Victor Harbor and the Goolwa – Victor Harbor canal, as per scheme 7 should have preference.*

It would appear that the improvement of Victor Harbor at a cost of 200,000 pound, without canal construction, would suffice for the smaller commerce of 114,000 ton'.

.....

8 November. The Milang correspondent to the Southern Argus wrote that the Lake had 'reached to a higher level than it has ever been seen since the great seventy flood'. He also said that 'People here are indignant at the proposal which has again been introduced into Parliament for draining Lake Albert, regarding it as a ridiculous one in view of the large areas of land elsewhere available, and in view of the admitted scarcity of water surfaces in the State'



*Flooded road
Narrung
District 1917*

6 March. The Register carried a report on 'Keeping the Lakes Fresh. Progress with the Mundoo Barrage. The construction of the barrage across the Mundoo Channel is an important experiment. It is the first chapter of what is expected to prove a happy story of conquest over the advancing forces of salt water. If Lakes Alexandrina and Albert are to be kept fresh, the Mundoo, which is the most direct gateway from the sea, must be equipped to resist the destructive encroachment; and not only this stream but others that link the lakes to the ocean. Mundoo is the test. Officially, the Engineer-in-Chief's Department, which is doing the work, knows nothing of future operations. That is a matter of policy. All that is disclosed at present is that Mundoo will be blocked; but as the Goolwa and Boundary Creeks and Tauwichee Channel would remain sources of danger unless a general scheme of effective prevention be adopted, it may be assumed that more projects are contemplated. The whole question has been an intermittent controversy for a number of years. It is one of the established river topics, and enough 'expert' opinion has been expended on it to fill several blue books – with a fair proportion of blue language! The explosives which blew up the temporary Mundoo barrage in 1917, did not blow the argument out of sight. The advisableness of that action is still keenly debated. The Departmental view was that the demolition of the barrage was not justified. The same objection was raised by Capt. Richie MP, during the vigorous speech in the Assembly, but the Director of Irrigation (Mr S McIntosh), backed up by protests from settlers on the Lower Murray, between Wellington and Mannum, who said the effect was to increase the height of the maximum flood, carried the day, so the Wedge came out.

The Work in Hand –

"This was roughly two years ago, and river identities today are still capable of discussing the point – it is a good place for an argument! The position now is, however, that the reconstruction of the Mundoo barrage with timber sluice gates is in progress. Just when the work will be completed cannot be said with any certainty. The Murray is tricky. The Engineer-in-Chief (Mr JG Stewart) stated on Wednesday that in order that the project should be effective in partially preventing the inrush of salt water into the lakes and lower reaches of the river, a line of sheet piling was driven across the opening made in the original solid structure. This piling was also required as part of the coffer dam necessary for putting in the foundation for the gate sill. The superstructure, stated Mr Stewart, was well on towards completion. The principal work yet to be accomplished was the foundation sill and gate frames. The total length of the barrage was about 1,800 feet. This consisted of an earth embankment covered with stone and across the actual width of the channel were being built the tidal gates. Beyond that the department had not been instructed to go – the rest was a matter of Government policy.

Larger Scheme Essential

It is clear, however, that if the Mundoo barrage be successful the larger scheme must be undertaken. Capt. Richie in the course of an interview yesterday, said the work was merely an experiment, as the Government had practically agreed that other channels which allowed the ingress of saltwater into the lakes would in due course be treated similarly. Otherwise the expenditure at the Mundoo would go for nought. 'To make the work thoroughly successful' he explained, 'It will be necessary to block from Pelican Point to Mud Island, then Ewe Island Creek and the Mundoo and all other low lying parts which are flooded at high tide. That would leave the whole of the Murray proper open from the mouth round past Goolwa and up into the Lakes. The proposal in its entirety would cost approximately 112,000 pound. As the previous barrage which was put in the Mundoo was blown out because the people at Murray Bridge raised a hue and cry about the effect of the water there has never been an opportunity to ascertain the benefit of such a work. It was no sooner completed than it was blown up, much, I may say, to my disgust. It is apparent that if the Mundoo project turns out all right, the Tauwichee channel and Boundary Creek must be blocked too. The position is that

1919

while the salt water would have to travel twenty miles up channel to get into the lakes the same point can be reached in the case of Mundoo in only four miles. With the other channels the distance is from six to eight miles. Mundoo is the short cut and it is important, of course to get that blocked first.

“It becomes a question of what may happen to the fishing industry if barrages are built across the various creeks which feed the lakes. Mr McIntosh is inclined to the opinion that the complete scheme would not offer any disadvantages. The fish, he said, would always have the Goolwa Channel, which would remain open. Mr McIntosh said the effect of the Mundoo barrage would be watched with interest and concern by settlers on the Murray, and it was hoped that the way was now opening to the solution of a long-standing problem. Mr McIntosh is still emphatic in his view that the right thing was done when the temporary barrage on the Mundoo was destroyed. The Murray Bridge people, he said, watched the gauges closely during the flood crisis and they were definitely of the opinion that, as a result of the block, the water was proportionately higher. The installation of tidal gates was the proper procedure and it remained to be seen what influence the improved barrage would have on the river and the lakes’.

.....
1920

20 May, Southern Argus. At a meeting held at Narrung in May to discuss the need for an outlet for the river trade, resolutions were carried asking that the Railway Standing Committee should visit the Narrung district to take evidence in respect to Goolwa as a port and an officer of the Irrigation Department to deal with the question of a barrage across the Lake Albert passage.

.....
1920

11 November. The Southern Argus carried a report on a meeting held in Strathalbyn, organised by the Strathalbyn Progress Association, on Irrigation at which the Director of Irrigation, Mr McIntosh, *‘touched on the possibility of the lakes becoming salt when the extensive withdrawals of water for the upper river irrigation works were made on the supply coming downstream, but hoped that some suitable storage scheme might be devised to compensate for the loss, and for the quantity taken from the lakes by evaporation.*

Replying to Mr Cheriton, Mr Laffer, Honourable Minister for Crown Lands, said he was as much desirous of keeping the lakes fresh as that gentleman was, and of keeping them as lake, for he appreciated the fact that they were the largest sheets of fresh water in the Commonwealth and a big asset’.

.....
1920

25 November, The Advertiser reported on Lower Murray Problems in November.

The Premier (Hon. HN Barwell), the Chief Secretary (Hon JG Bice), the Commissioner of Crown Lands (Hon. GR Laffer), and the Commissioner of Public Works (Hon. W Hague), visited the Murray Mouth and Coorong. They desired that the barrages, which have been authorised by Parliament to prevent the flow of saltwater into the lake, should be completed. One of these had already been constructed across the Mundoo channel, and the survey of the proposed barrage across the channel from Pelican Point to Tauwitchere Island had been completed but the work of construction had not been commenced.

.....
1923

3 May. Newspapers carried reports of a meeting held in Strathalbyn to discuss the proposal being talked about of draining Lakes Alexandrina and Albert. *‘A meeting was held in the Strathalbyn institute hall called by the Bremer district council at the request of WP Dunk in response to a suggestion that Lakes Alexandrina and Albert be drained. Some discussion took place, but Mr EJ Tucker pointed out that there was a Minister of the Government present, Mr Laffer, and he moved that he be asked to tell the meeting of the plans. Mr Laffer said that the civil servant who had been responsible for the suggestion was not authorised to make such a statement. In fact the present government had never contemplated the draining of the lakes.*

1923

Discussion then followed on the erection of barrages and 'efficient steps for keeping the valuable asset of the lakes fresh'

A motion 'That this meeting of landholders interested in the preservation of Lakes Alexandrina and Albert, having heard the statement of the Minister, is satisfied that the present Government does not contemplate any action in the project for draining of the lakes., but protests against any other action being taken inimical to their interests in this direction and urges on the Government the immediate and proper reconstruction of the barrages at Mundoo' It also desires to press on them the desirability of measures being taken to conserve the waters of the lakes, and to hasten the establishment of a sea-end river port, but no formal resolution was arrived at.

.....
1923

.....
31 May. The River Murray Agreement. Letter to the Editor from J Cowan, Parliament House.

Sir, The settlers on River Murray irrigation areas and landowners adjacent to the lakes are naturally much perturbed about the low level of the river and lakes and the saltiness of the water. Much anxiety is also felt as to the NSW Parliament not ratifying the 1920 agreement. The suggested amendment of the agreement by NSW will be discussed at the Premier's Conference now sitting in Melbourne. We are fortunate in having so capable a person as Hon. JG Bice representing this State on such an important issue. The agreement is a bad one for the State, but it is the best obtainable from our selfish neighbours who have for the past quarter century adopted a dog in the manger policy and for that length of time delayed the works of locking and conservation. The 49th clause of the agreement allocates to South Australia, 1,254,000 acre feet, such quantity being provision for irrigation, domestic and stock supply, losses by evaporation and percolation in Lake Victoria and like losses and lockage in the River from Lake Victoria to the river mouth (but not including Lakes Alexandrina and Albert). It is noteworthy that the lakes have been purposely excluded.

The quantity mentioned is the minimum. I have no doubt but that it will eventually become the maximum, and in periods of drought and low river we will not get our allocation. Under such conditions it will be impossible to keep the lakes fresh not even if the mouth were dammed, as the following figures will prove.

Page 13, paragraph 43 of Major Johnston's report gives the area of Lake Alexandrina as 220 square miles. Lake Albert 66 square miles. Lake Victoria 25,600 acres and Lake Bonney 4,000 acres. The area of the river from Lake Victoria outlet to Lake Alexandrina entrance approximately 23,300 acres. The evaporation is estimated at 5 acre feet over the whole area, approximately 1,179,700 acre feet. Thus our minimum allocation is practically exhausted by evaporation which as previously mentioned we don't get in dry periods. Under these conditions the lakes (and probably the lower river) must necessarily become salt, and we will have a repetition of the troubles of the Nile Delta where the lakes at the entrance of the Nile into the Mediterranean is as salt as the sea, if not more so. For considerable periods, not a drop of freshwater enters the Mediterranean through the Nile, despite the fact that the river has a flow nine times the volume of the Murray'.

.....
1924

.....
24 May. The Southern Argus published a letter to the Editor from. Mr Wm Saltmarsh on draining Lakes Alexandrina and Albert. In it he advocates reclaiming the lakes to provide more land for agriculture. He believed this would solve the problem of keeping them fresh. He also believed the Port of the Murray could be built at the end of the channel across Lake Alexandrina.

European settlement

7 May, Southern Argus. The Prime Minister and party visited Goolwa in July. The Mayor (Mr John Ritchie) conducted the Prime Minister to the wharf, and pointed out the site of the suggested canal from Goolwa to the sea. Mr Ritchie said he considered that if a cutting a mile in length were made, vessels drawing nearly 30 feet could come alongside the wharf at Goolwa, and handle the whole of the traffic from the Murray valley.

.....

Conference of Ministers held in Canberra, during February formulated the following resolutions on the River Murray question.

Resolution 1, That construction of Hume Reservoir to be continued to a capacity of 1,250,000 acre feet, providing ability to continue to 2,000,000 acre feet.

Resolution 2. The River Murray Commission enquire into (b) advisability of construction of works or allocation of additional water to protect lower river against salinity. (c) On the question of advisability of revising the River Murray Agreement so far as it relates to the weirs and locks on River Murrumbidgee. (d) on the question of the responsibility for expenses in connection with maintenance operation and control of completed works and gauging stations.

These questions referred to River Murray Commission.

Between Mannum and Wellington 11500 acres are under intense culture, about 5000 acres are privately owned. A further 3000 acres could be reclaimed. Estimated annual value of production is 200,000 pounds. The principal use is dairy farming, market gardens and sheep fattening. The return from the Government land is 159,000 pound comprising dairying – 117,000 pound, sheep – 5000 pound, fruit – 30,000 pound, vegetables – 7000 pound. The cost of reclamation was 1,198,839 pound.

It was estimated that the annual discharge of River Murray at Murray Bridge less that diverted by other States in diversions from the upper reaches would mean that for a 39 year period the requirements needed for the Lakes, 4 years the lakes would be practically salt, another 5 salt for portion of the year (not bad but not quite good enough) the rest of the years they would be 'very considerably improved. That would mean 9 years out of 39 they would be more or less bad'

Cost of proposed barrages 549,000 pound. At present 12 weirs out of 34 proposed under River Murray Agreement have been constructed. The total cost would be 1,200,000 pound, South Australia's share 300,000 pound.

.....

11 February. A Deputation met with the Honourable the South Australian Minister of Agriculture regarding the maintaining of fresh water supplies in Lakes Albert and Alexandrina and the Lower Murray. The purpose of the deputation was to bring before the Hon. The Minister the importance of preventing salt water from getting into Lakes Alexandrina and Albert and the keeping of the lower River fresh. The Minister contended that South Australia had suffered as a result of conferences with other States and it appeared that this State always got the worst of the deal.

The deputation informed the Minister that there was about 180 miles of frontage around the Lakes and the importance of the matter at hand would be realised when it was considered how much money had been invested in this land. Values had been much higher on account of the fresh water facilities. Landowners felt they had a serious grievance in as much as it looked as though they were likely to be robbed of their riparian rights by the substitution of salt water for fresh. One of the consequences of this would be the destruction of vegetation and there would be more erosion than is going on at present. He said that the finding of these Lakes by Sturt was originally responsible for the establishment of the State following on his glowing description of the possibilities of the surrounding area.



Looking downriver near Clayton (2004)



Near Clayton looking upriver (2004)

1930

Mr PT Heggaton, MP said that he felt that nothing should be done to prejudice the rights of landowners. Thirty years ago they had fresh water for all but two months in the year at Hindmarsh Island but the position was now reversed and water had been salt for ten months of the year. His own water supplies were shallow wells and because of the incessant and constant flow of salt water, these waterholes had been seriously affected.

Mr GG Hacket of Narrung said that he had been in the vicinity of the Lakes for very many years and had seen the serious results of the salt water. The fact that they thought they could obtain fresh water supplies had enticed landowners around the Lake to pay very much higher prices for their land, and they had been taxed accordingly. Where previously there had been plenty of rushes and waterweed, which could be used as feed, this had now disappeared with the encroaching salt water and put them at a decided disadvantage. Many men who had bought water rights had now been deprived of such rights. Settlers at Narrung were previously able to water at the Lake frontage but now had to depend on wells.

Mr FG Ayres said (amongst other things) Landowners had taken up their land expecting to obtain a plentiful supply of fresh water and their rights should undoubtedly be preserved.

Mr Goode of Narrung said that he was one of the original landowners in 1907 and from observation was satisfied that their water supply in the wells was definitely dependant on the Lake water. During the last few seasons some of their wells had gone brackish. Some years ago the Government had sent Mr Jack down with a view to obtaining bore water on the shores of the Lake but he had not been successful. Their water supply was absolutely at the mercy of the Lake and if the Lake waters were allowed to become salty, they would have to leave their holdings

14 February. The Mount Barker Courier reported that 'Mr GG Hackett, one of the oldest settlers in the lakes districts, said that up to two or three years ago wells were unknown on the Narrung Estate, but every settler was now forced to water stock in this manner. That the riparian rights of the settlers were recognised was exemplified in the fact that their land tax was assessed on the basis of those rights'.

Stock feeding on lakeshore (early 1900s)



29 May. River Murray Commission at Goolwa. As a result of a deputation of lower Murray and lake residents, who waited upon the Premier some time ago regarding measures to cope with the salinity of the waters in the lakes, the members of the River Murray Commission visited Goolwa. Mr EB Rankine (chairman of the Port Elliot District Council) told the commission that until recent years it was unusual for the water to be salt around Hindmarsh Island for more than a month or two in the year. The water had now been salt for 18 months. Wells had been affected, and he considered that the value of the land adjoining had decreased by one third. There was approximately 120 miles of frontage land in the district. Mundoo Island, which had once carried 4,000 sheep, now had about 2,000. Mr Heggerton, MP, said the carrying capacity of the land for cattle grazing purposes was now only two-thirds of that which obtained before the salt water was so much in evidence. He favoured the transformation of Lake Alexandrina into a canal because of the large evaporation which took place. Councillor Sweetman said for the last six to eight years it was noticeable how the reeds and willows had died. In 1914 and 1915 the water was brackish as far up as Tailem Bend.

Mr KD Bowman said that he had attempted irrigating lucerne but had not persisted. More than ten years ago Murray Cod had been caught in the lakes, since that time mulloway had been caught as far up as Murray Bridge.

Mr H Shipway, an old resident of Currency Creek said that the reeds and rushes disappeared since the advent of so much salt water, and the stock had consequently been reduced. The conditions today were worse than ever.

.....

29 May. The River Murray Commission visited Milang and took evidence regarding the salinity of the lakes and other matters. The chairman of the District Council of Bremer (Mr AW Pearce) welcoming members and offering facilities for them to secure the information they were in search of. Mr Pearce informed the Commission that during recent years the salinity of the lake waters had become an increasingly vital matter to stockowners and other residents on the shores. The value of the land had depreciated, the stock capacity had decreased also, and water for stock had become a very serious matter. It was deplorable that while ten or twelve years ago they had a fresh water lake they had now almost constantly a salt one. He referred also to damage to fodder growths, fencing and other resultant evils due to salt water, the reduced flow of the

1930

.....
1930

Murray from the upper reaches naturally accounting for lower lake levels, and consequent easier contamination by seawater from the river mouth. He warmly advocated the blocking of the mouth and leaving the Goolwa channel open.

Mr DB Warren supported Mr Pearce telling the Commission that the district was essentially a dairying one, but the profit of the industry on the lake shores was being steadily depleted by the expenses that were increasing through the constancy of salt water. There was ample proof that the impounding of water upstream had been contributory to the lakes becoming salt. If work had been started at the sea end of the river, making provision for overflow at flood times, the lakes would have kept fresh, heavy expenditure would have been saved, and the evils the district was suffering from would not have become existent. The effect of a barrage at the mouth would be to sweeten the lake and lake frontage every time a river flood came down. There had been a scheme to irrigate the fertile plains in the neighbourhood of Milang and Lake Plains, but it had to be dropped because the lake water was so often salt.

Mr Eaton (a member of the Commission) pointed out that it was hopeless to expect much freshwater downstream to freshen the lake, as it would require a million acre feet to do this, and the total average flow was only four million acre feet. The other states refused to allow for the evaporation regarding the big surface area as useless and wasteful.

Mr EE Newell said that surely the engineers had allowed for evaporation, but Mr Eaton said that they refused to listen to South Australia on this matter; and possession being nine points of the law they had their way. There had been a proposal to construct a river channel to Point Sturt reclaiming the lake, but the cost was too heavy with the small population concerned to warrant it and it was dropped.

Others to give evidence were Edward Beavor Rankin, Hindmarsh Island who told the Commission *'From twelve to twenty years ago they used to carry 4,000 sheep; today they can only carry 2,000, because the salt water has spoilt our frontages. Wells on Hindmarsh Island have gone salt. On my own property I can only keep 2,000 sheep, where it was a regular thing to keep 3,000. There is 129 miles of frontage, roughly in our district (the District of Port Elliot) and if you take the figures I gave you in regard to the carrying capacity, you can arrive at it. I should think 1/3rd of the value has been lost through salt water. On Hindmarsh Island, with fresh water all the year round, the value of the land would be ten pound per acre; with salt water it depreciated between six and seven pound. With fresh water it would run 1 1/2 sheep to the acre.'*



Flooding at Narrung 1931



Percival Thomas Heggaton of Hindmarsh Island said, *“When I first went to Hindmarsh Island I could carry 100 cattle for a mile back from the River. Today I cannot carry 2/3rds of the number. However, Mr Stuart Murray suggests that it is six miles back on the total frontage which is affected by salt water. The loss per annum would be sixty thousand pound applied to a large proportion of the lakes, or right up to Wellington, a loss of say one hundred and twenty thousand pound per annum.”*

Henry Cornelius Shipway of Currency Creek informed the Commission *“A good bit of decrease in the number of stock kept on the frontage now I have to run them on the back country. On Currency Creek the reduction would be a half compared with twenty years ago. The salt does not affect the wells in this country.”*

31 July. In regard to salt water in the Murray, landowners, with representatives from Meningie, Milang, Goolwa, Narrung, Murray Bridge and Taillem Bend, held a protest meeting at Strathalbyn on 25th July.

They favoured urging immediate action to keep the water fresh in the lower River Murray and lakes.

The chairman said owners of land abutting the lower river and lakes were liable to be deprived of a right they had paid for. There was no doubt that a barrage at the Murray mouth should have been the first work done under the River Murray Commission. Last year had shown all the residents around the shores of the lake the need for conservation of the fresh water. They had sat still for too long and must fight for the one object to keep the water fresh.

In regard to fishing in the lake the chairman said that saltwater fish were there through an entirely false position. In earlier days these men had caught freshwater fish.

A resolution moved by Mr LH Landseer was adopted *‘That the irrigation and conservation schemes in Victoria and New South Wales having deprived the lower River Murray and the lakes of the natural flow of water, the landowners request the Government to take immediate action to preserve the riparian rights of the owners of land abutting the river and lakes; and that before any further expenditure is incurred in the locking and dealing with waters of the river, the vital necessity be urged upon the Government of this State of constructing barrages, as was the intention of surveyors and engineers in 1902, to conserve the fresh water in the lakes and river, and that an adequate supply of water be provided for the purpose.’*

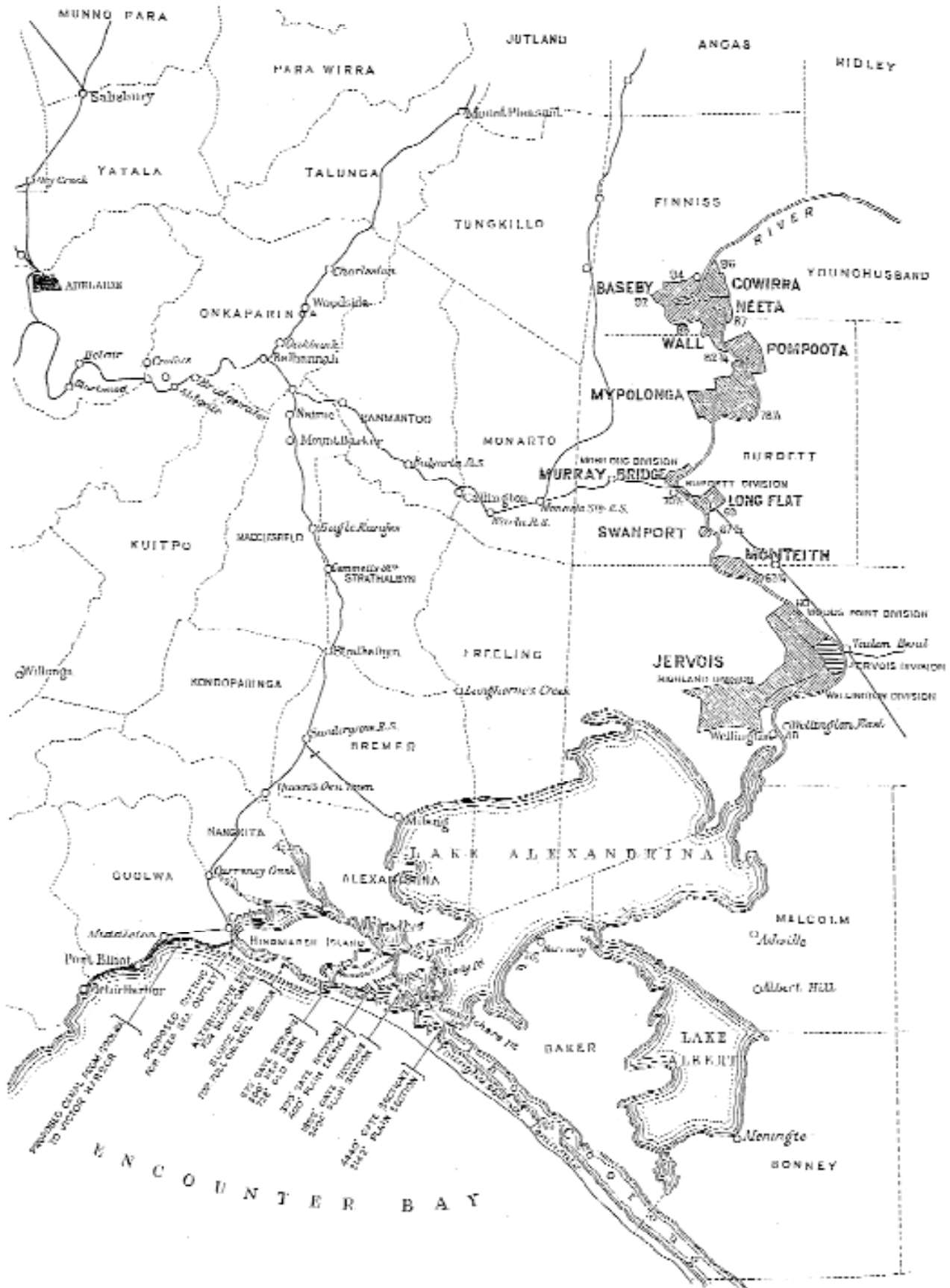
This was seconded by Mr KD Bowman, and agreed to.

The meeting was unanimous in its expression of the urgent need for the wasteful runoff to the sea of the waters of the river being prevented by a suitable barrage impoundage, with proper flood gates provided, the general idea being that until the loss of fresh water at the mouth was stopped South Australia’s case was likely to meet with little sympathy from the upriver States and the residents of the catchment areas. Mr Eaton’s estimate of the evaporation losses from the lakes was warmly criticised, Mr Ayres, Mr Hackett, Mr KD Bowman and several speakers contending that while Mr Eaton’s calculations might be theoretically sound they were practically ridiculous, with nothing being allowed for the local rainfall, natural drainage, the humidity of the neighbouring atmosphere and a host of other factors which did not operate in the country records on which the engineer based his estimates.

The following executive committee was appointed to carry the resolution into effect:
- Messrs T McCallum, EH Bakewell, LH Landseer, G Hackett, A McFarlane, FG Ayres, KH Bowman and EB Rankin’

31 July. Deputation of landowners adjacent to Lakes Alexandrina and Albert met with the Commissioner of Public Works, Hon J McInnes, with regard to the Lakes and lower reaches becoming salt. They presented a resolution which had been carried at a meeting held in Strathalbyn on 25 July, *‘That the Irrigation and Conservation schemes in Victoria and New South Wales, having deprived the Lower Murray River and the*

PLAN SHOWING PROPOSED BARRAGES AT MURRAY MOUTH.



From 1933 Parliamentary report

1930

Lakes of the natural flow of water, the landowners request the Government to take immediate action to protect the riparian rights of the owners abutting the Rivers and Lakes. And that before any further expenditure is incurred in locking and dealing with the waters of the River, the vital necessity be urged upon the Government of this State of constructing barrages as was the intention of surveyors and engineers and recommended in 1902 for the purpose of conserving the freshwater in the Lakes and River, and that an adequate supply of water be provided for such purposes.'

Mr Hacket said he wished the Government to note the conditions existing when they had fresh water.

Mr Ayres said he had been a settler on the Lakes for 40 years and could remember when both Lakes were perfectly fresh all the year round, with weeds growing on the margin.

Mr Landseer said South Australia should not allow water to run to waste, hence the necessity for barrages at the Mouth of the River

.....

November, A conference of Ministers discussed the proposed Murray Mouth barrages. South Australia's representative said they had for many years been endeavouring to secure what they considered their Riparian Rights along the River Murray. It was foreseen that when New South Wales and Victoria diverted the full quota of water allocated under River Murray Agreement there would be at times no summer flow in lower Murray and salt water would flow up to Blanchetown unless some remedial measures were taken.

Prior to 1925 complaints from settlers of their inability to gravitate water through their embankment sluices were rare. Since 1925 there has been long periods almost every year when settlers especially above Murray Bridge have found it impossible to water portion of their land. Therefore urgent action is required to keep the river fresh.

.....

7 July. The Mount Barker Courier published a letter to editor from A Duncan of Murray Bridge suggesting that *'barrages will be a waste of money because the salt problem in the River (and Lakes) is caused by saltwater creeks and saltwater springs in the riverbed. He contended that these have increased since locking had taken place. The river according to him was saltier above Loxton than at Murray Bridge'*

.....

10 August. In an article entitled *'More Opponents of Barrage'* readers were told that *'Old River Pilots Not Impressed'* with the idea of a barrage. Captain Dan Cremer senior, who had spent more than 50 years on the river, thinks that a better plan would be for South Australia to come to terms with other States to get our fair quota of water and leave the Murray Mouth alone.

Saline seepage was coming into the Murray in enormous quantities from all the irrigation settlements continuously, Captain Cremer declared, and that from Cadell and Waikerie was almost as salt as the sea.

Mr Edwin Withers, of Nalpa Station, Lake Alexandrina, expressed the hope that a meeting of the landholders on the lakes would be arranged. *'Unless something is done, we will lose our riparian rights to the lake, and the value of our water frontages. Since we have been here, 150 yards of land on the edge of the lake have been washed away, because the rushes, which held it together, have been killed by salt water. Sometimes the water is so salt the stock will not drink it, and we have had to lay down six miles of piping to connect up with the fresh supply from Murray Bridge'*

1932

1933

1933

1933

10 August. A letter to the editor was written by WAL Wolter offering advice from a River Navigator regarding the Murray Barrages. It said *'Sir, I have been engaged on the Murray, Darling and Murrumbidgee river since 1864, and I have watched the progress of the settlements from the beginning. When irrigation was introduced at Mypolonga, I noticed two ditches, one deep, to drain off the seepage, and the other not so deep. The deeper one ran back into the river, and the other was used to supply water for irrigation from the pumps. The running of water back into the river applies to all river settlements. The seepage lodges in the bottom of the river, and the fresh water flows on the top. Seepage has run for years from the various settlements, and lodged in the deep holes in the river. It is moved down stream when a flood comes, and finds its way to the lakes. Thereafter most of it moves into and remains on each side of the direct channel, accumulating where there is no currents, and causing the lake to become brackish. It is affected only by wind and high floods coming down the river. For this reason the water held up by the various locks should be released as often as possible, whenever a flood will allow it to refresh the whole stream. This would also benefit fish life. The best water to purify the river water is good Darling flood, which comes down white in colour, but becomes settled in its course down stream, and helps to sweeten the water.'*

I hold with Mr Eaton that if the barrages will resist the high sea tides and keep the sea out of the lakes, and if they are open at low tides to let the salt water out of the lake, no settler around the lake will have any reason to complain. This is the only way to relieve the lake of accumulations of salt seepage water'.

1933

17 August. The Advertiser contained an item *'Barrages to Restore Riparian Rights. Narrung Settlers Support Scheme (Floods Not Feared)'*. The article stated *'Argument by farmers as to why the barrages should be constructed. Mr Holtham said 'The reeds and rushes started to go out in 1914, I used to be able to get good soakage water for a year or two, after which it became saline. Now I cannot get it anywhere. I formerly carried 90 to 100 dairy cattle, but today the capacity is not more than half that number. I find too, that the salt water the stock drinks adversely affects their health'.*

People on the Lakes are barely making a living now, according to Mr JW McNicol, who told me that, when he started at Narrung 26 years ago production costs were very low. It was only necessary to grow feed for horses. The carrying capacity had depreciated to such an extent that now he and others had to hand feed their cows which die otherwise. Mr McNicol recalled that he had worked on Narrung for 5 or 6 years before salt water appeared, and tons of clover could be mowed there. They sheared 20,000 sheep there, carried 400 head of cattle, and 200 to 300 horses.

"Something must be done to restore our riparian rights, and we firmly believe this can be done by erecting barrages'. Said Mr Don Bakewell, a member of the Yalkuri Pastoral Company. 'Land round the lakes was purchased with definite riparian rights, and has been taxed accordingly. These rights entitle the landowners to the use of fresh water for all time. When irrigation started in Victoria and New South Wales, lakes landowners realised the danger to their rights, and stated their fears to the Interstate Commission in 1902. The Commission recommended the construction of barrages. Then when the locks were made and the water diverted through open earth channels higher up, the troubles of the people on the lower river and lakes began in earnest. Unless something is done, the lakes, and probably wells, will become permanently salt. Already this land has depreciated in value, and the carrying capacity is being seriously reduced'.

The late Mr AP Bowman told Mr Bakewell that before the locks were built it had been necessary to remove stock from one of his best fattening paddocks only once in 17 years, because of salt water in the lake. The present owners have had to do that 11 times during the past 14 years, and this paddock will presumably become useless if the salt menace increases'.

6 October. Evidence given to an enquiry into the construction of barrages contained the following statement, '*Riparian rights entitled Lake landholders to freshwater at all times. When water diverted higher up (before 1902) troubles in the Lakes started. Yalkuri prior to 1918 watered solely from the Lake. Supply of freshwater existed before diversions upriver. Very few reeds now at Pelican point*'.

6 October. The following evidence was given at Goolwa to the enquiry into the construction of barrages.

Robert Henry Sweetman, *it will make Coorong an arm of the sea and will simply be tidal. In 1914 pure saltwater to Murray Bridge and salty water to Mannum. In the last 18 years the sea has advanced 140 yards nearer Goolwa and the sandhills are only half as high as they were 30 years ago. During the last 30 years the Murray Mouth has moved inwards towards Hindmarsh Island and Mr Rankine has lost a strip of land full half a mile wide by about one and a half mile long. The force of the sea has moved the spit in from three quarters of a mile to a mile towards Hindmarsh Island.*

Edward Beevor Rankine, *For the past 45 years I have noticed reeds and grasses that grew along edge of river have gradually died. As soon as we get fresh water the reeds come up again. 30 years ago Mr Grundy on Mundoo Island could carry 4000 sheep now only 2200 because of the saltwater. We bought our land in the early days when the water was fresh but today it is salty.*

The enquiry also took evidence at Milang.

HCF Kruse, *I was on the steamer Dispatch, and it was my job to fill a cask (for drinking) every day for five years using nothing but Lake water. After a long blow of two or three days the saltwater was from around Point Sturt to the Mission but as soon as wind stopped water went back.*

John Woodrow, *In 1914 Lakes were exceptionally salty. In spring 1915 water was fresh. The Coorong was considered a profitable fishing area and the Black Bream abounded in millions. At that time the floodwater from the South East flowed into the other end of the Coorong. Today the whole of that water is diverted by two drains and the only fish caught today are mullet.*

Daniel Cremer, *We have had saltwater in this Lake for years. If the Murray is controlled so that we will get no flow this Lake will become a dead sea.*

Samuel Herbert Goldsworthy, *Water from Milang to Point Sturt first to get salt last to get fresh. I cannot carry half stock on frontages as I was*'.

William Sinclair Yelland representing farmers in the Hundred of Alexandrina, Pearce AW, JV, ME, EJ, TE, Mitchell AJ, RE., Oakley JA, Scarfe KL, Yelland JM, Thorpe RP, WS., Dunn LEL, Leslie A., Rzeszkowski J, Thorpe JW, who occupy holdings totalling 20,000 acres. *They rely on freshwater from Lakes and river. Some have had to put down wells because of saltwater, the cost of the well, windmill and trough is one hundred pounds. Many years ago the frontages were reeds, today frontages are sheets of water. The reeds were killed by the saltwater*'.

William Samuel Day, *if the barrages will bring the Lake to 50% of what it was thirty years ago it would be a good scheme.*

Evidence was also taken by the enquiry at Poltalloch Homestead where J Trafford Cowan told them, *He had an area of 2400 acres wholly dependent on Lakes (for water). Prior to locking lakes were never really salty enough to damage stock. At Narrung the landholders said the 'riparian rights entitled them to freshwater at all times. When water was diverted higher up (before 1902) troubles in the Lakes started. Yalkuri prior to 1918 watered solely from the Lake. Supply of freshwater existed before diversions upriver. Very few reeds now at Pelican Point*'.

George Roy Goode, *erosion of Lake Albert, until late years, when saltwater came into Lakes, the shores were protected by freshwater reeds and lignums. In lake freshwater weeds prevented break of waves*'.



Mundoo Barrage (late 1930s)
SA Water

1933

John Marshall Holtham, '26 years ago Lake much fresher, reeds, bulrushes and waterweed grew around Lake.

Allan Campbell, 'Erosion meant loss of plant life. Fences need to be run a long way out into shallow water of the Lake to keep stock in'.

Edward Leslie Goode, 'I can remember when it was a remarkable thing when the saltwater came up to the Goolwa wharf. Now we see saltwater in the Lakes for months' 31 October. In Adelaide the Advertiser published a letter to the editor from T Charles Good regarding the Murray barrage and the effect huge diversions of water had had on the system. 'Sir, Few South Australians realise how important the Murray barrages are to this State. Since 1888, when Messrs Chaffey brothers started at Mildura, more water has been diverted until now streams like small rivers run far into Victoria down as far as Lock 9. Mildura supports 11,000 people.

Red Cliffs is said to have the largest pump in Australia; Merbein is coming on also. In New South Wales 25,000 tons of rice was grown last year, apart from large quantities of fruits. In 1901 Lakes Albert and Alexandrina were fresh. Lucern (sic) at Meningie would grow to the water's edge, and fresh waterweed grew for a mile out into the lake, and cattle stood in the water eating it. At Narrung reeds eight feet high grew, so that a sailing boat could shelter in them, and in the summer they were good stock feed. These also flourished at Point Sturt and in the Currency Creek. At port Agnes willows were so thick that in a storm a vessel could lie in perfect calm behind them. On the jetty at Point McLeay Mission Station were wool scourers, and at Poltollock (sic) an engine pumping to the garden. Little by little all this has gone; and in my opinion, if we do not stop the flow of fresh water out and salt water in, we will hereafter have the sea up to Swan Reach.

The late Mr Allan McFarlane, Sen., said some years ago that the lake could be held to four feet, about (above?) low level, without damaging his low country. In 1903 the Murray Mouth only had a few inches of water most of the way across from Sir Richard's Peninsula to Hindmarsh Island, and there a narrow channel only 2 feet 6 inches deep. Mundoo Channel had only nine inches on the bar, and Deep Creek and Towagerie less than 18 inches. Those that fear that the silting up of the Mouth will cause danger, can note that as soon as the river came down the Goolwa Channel cleared itself along Sir Richard's Peninsula, and no one heard anything about obstructions. Fishermen about Lake Victoria, which is artificially held up, tell me the cod will breed up again if given a chance. Concerning the ocean swell, I can remember the mouth since I was there in the Albury in 1878, when there was ten feet on the bar, but the ocean swell never came any distance up the river. The swell is broken on the bar a quarter mile or more out. T Charles Good, Lock 8 River Murray'

3 November. An item on how the saltwater was affecting Lakes Alexandrina and Albert was published in the Mount Barker Courier. In this article it noted that EJ Withers stated before a Public Works Committee that *'before the work of locking and conserving water in the upper Murray began he (at Nalpa) had had little trouble with salt water. Occasionally in autumn, when there was a low Lake strong winds would bring up some seawater, but the current of the river or a north wind drove this back in a day or two and Lake Alexandrina would be fresh again'*.

Nalpa and Wellington Stations depend on the Lake for water for some of the stock and Wellington Lodge and Paltaloch are entirely dependant upon it. Paddocks not on the lakefront must have lake water pumped to them. Bores have been put down in various parts of Paltaloch without success. Shallow soakage wells on all the properties give a limited supply which becomes salt when the lake is salt'.

September. The second reading of the Murray Barrages the Bill To Ratify New Agreements

To South Australia took place in the South Australian House of Assembly. This was to ratify the agreement entered into by the Commonwealth, New South Wales, Victoria and South Australia for the construction of barrages on the River Murray to prevent the influx of salt water from the ocean. *'In moving the Bill the Commissioner of Public Works (Mr Hudd) informed the House that the barrages would have a marked effect on the volume of production on reclaimed swamplands. If the barrages were constructed it was anticipated that the settlers would be able to utilise the water during the periods of low river without any fear that the river would become salt and ruin their crops. The settlers on the foreshore of Lakes Albert and Alexandrina would also derive considerable benefit from the barrages Mr Hudd said. The increase in the amount of water taken from the Murray in Victoria and New South Wales, in conjunction with periods of reduced flow in the river this had led to such prolonged periods of salinity in the lakes as to destroy what was at one time a luxurious growth of edible reeds on the foreshores. The proposed works were expected to restore the conditions that existed before water began to be drawn off for irrigation.'*

2 November. Article appeared in the Mount Barker Courier saying that work to construct the barrages was to begin immediately at a cost of 600,000 pound. A work force of about 300 men would be employed. The result would be that *"Settlers will have restored to them about the same fresh water conditions as existed before the huge irrigation schemes higher up the river reduced the quantity of water coming down."*

It was expected to be some time before the lake front returned to good condition because the seawater had destroyed the natural grasses and impregnated it and the lagoons with salt.



Goolwa Barrage (late 1930s)
SA Water



1935

28 February. Southern Argus. *'The Barrages. About forty men are at work on the Murray Mouth and at Mundoo. The work so far has been mainly confined to bringing down the Murray materials of an engineering nature from the locks. The erection of the walls has been made a fairly simple matter by modern engineering. A big scooper-excavator travels along and throws a high bank of soil on both sides of a drain. In this trench a wall of concrete is built, which is ramified by the soil on both sides. There will be a considerable amount of employment when the work reaches the neck.'*

1935

18 April. In The Mail the item 'Work That Will Absorb 700 Men. Murray Scheme Jobs' said. *'Construction of the barrages will cost 600,000 pound. They will take three years to complete, and will restore to settlers along the Lower Murray approximately the same fresh water conditions that existed before irrigation began to drain off huge quantities of water higher up the river.'*

1935

23 May. The Advertiser. Murray Barrages Inspected. Effect of Improvements. Sounder Water Supply. River Murray Commission members visited the Murray Mouth. Mr T Hill, Deputy Chairman (representing the Commonwealth) said, *'The South Australian water supply will be very sound when the barrages at the Murray Mouth are completed, as they will keep the lakes and lower reaches of the river fresh, and the big storage of Lake Victoria, with the capacity of half a million acre feet, will ensure an adequate supply. The barrages are essential to this State, as when the big irrigation schemes comes into operation in New South Wales and Victoria, a much lesser quantity of water will come down the Murray to the Mouth, and there will be a much greater liability for the lower part of the river to become salt. Barrages will remove this danger.'*

Mr Hill said that the two sites for the barrages had been approved, and boring was going on at the other three. The main barrage was at the Goolwa channel, where work was already in progress. The site of the Mundoo channel was also approved. When the water supply channels now being constructed by New South Wales and Victoria were completed they would draw off from the Murray a quantity of water equal to half the mean annual flow. This was provided for by the agreement that allowed for 1,000,000 acre feet to each of the States mentioned. Some of these channels would be 100 feet wide at the bottom and 9 feet deep.

1935

9 April. Southern Argus. 'Good progress is being made at the Barrages, and concrete work will be started very shortly. Stone is now being placed in position on the bed of the river, about 30,000 ton of this being carried from the quarries. It is also hoped that the few chain of road from the railway to Mr HA Armfield's boat shed will be completed. A first class road right to the barrages will be greatly appreciated by the contractors and the immense numbers of tourists who visit the works.'

1936

At the Mundoo Barrage the first cofferdam has been pumped out, and construction work will now begin there'.

3 May. Southern Argus. 'Barrages. Work at the Goolwa Barrage is nearing finality. All the cement concrete piles, etc have been completed, but a fair amount of stone paving and cleaning up must be done before the last big coffer dam will be flooded prior to removing the sheet piling and insertion of the blocks. Some men are already due for dismissal from the works, and it is expected that by the end of June the main Goolwa job will be almost finished. Great progress is also noted at Pelican Point, where at present a very large number of men are employed, and work there on the last coffer dam has commenced. The River Murray Commission visited the respective works recently, and members were greatly impressed with the work accomplished and with the rapid progress'.

1936

5 July. Southern Argus. Goolwa News. 'Barrages. A commencement has been made in demolishing the last cofferdam at the Goolwa section of the Barrages. It is expected that the works will be completed and ready for operation at the end of the year. About fifty men are now engaged in planting Marram grass on the sandhills of Sir Richard's Peninsula. The grass is effective in checking sand drift. One hundred steel gates each weighing over a ton, are being placed in position at the completed Ewe Island works. Great progress is also being made at Pelican Point, where at present the greatest number of men are employed'.

13 September. Southern Argus. 'Work is almost finalised at the Goolwa barrage; there now remains only the clearing up and construction and insertion of the stop logs for this section to be completed. Recent reports mentioned that an official opening of the barrages had been scheduled for September 30th, but this seems rather doubtful of fruition'.

1936

8 February. Southern Argus. 'Barrages. Great progress is being made at all sections of the barrages. Work at Mundoo, Boundary Creek and Ewe Island has been completed, and only Goolwa and Pelican Point remain to be finished. About 450 men are at present employed, and by the end of the year it is expected the whole of the undertaking will be finalised'.

1939

29 May. Southern Argus. 'After being closed for several months it has been found necessary to remove about one hundred of the stop logs at the Barrage, thus letting a lot of the water out, as it had banked up very high and flooded a considerable area of land. Fresh water has been running through for the past week, but the level at Goolwa is still the same'.

1940

Goolwa Barrage looking towards Hindmarsh Island (2004)



14 11 100 71

Tauwitchere Barrage no.(1) (2004)

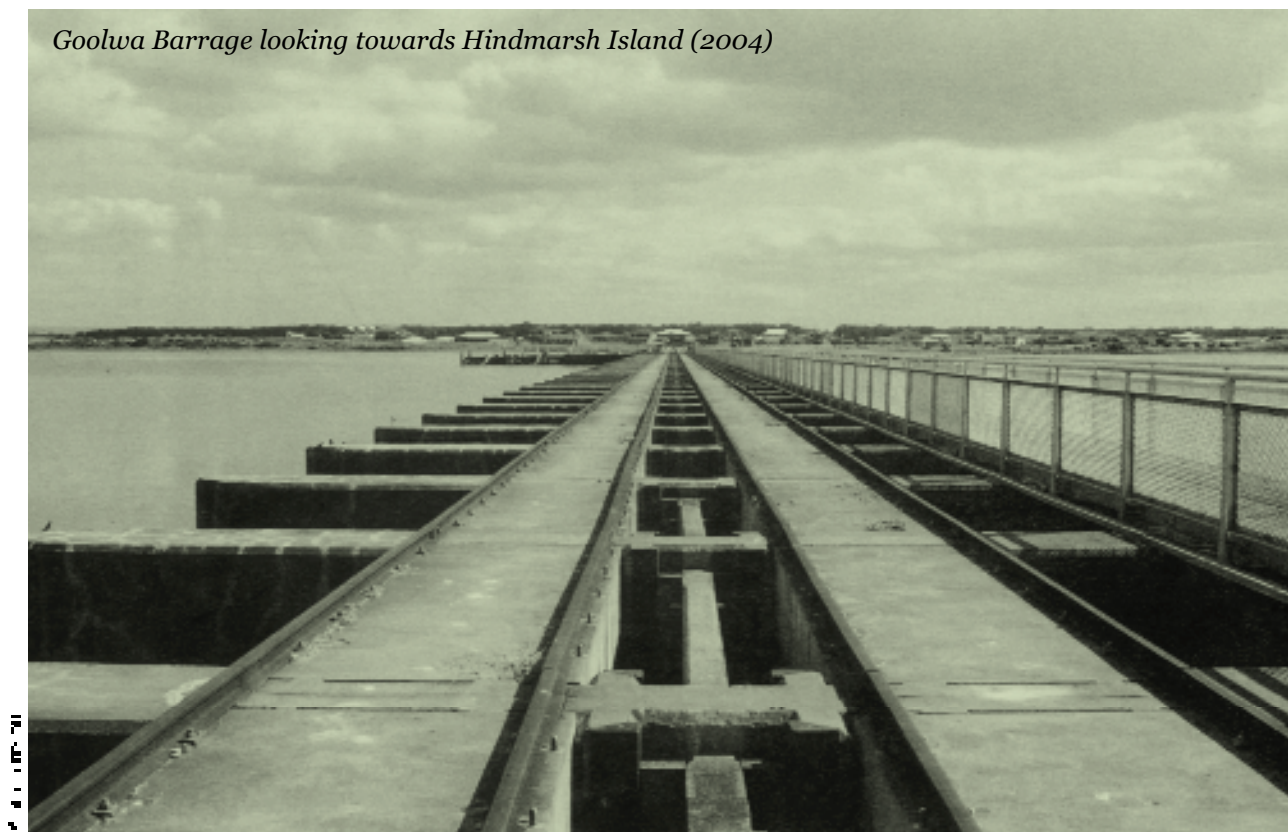


14 11 100 71



Tauwitchere Barrage no.(1) (2004)

Goolwa Barrage looking towards Hindmarsh Island (2004)



19 June. Southern Argus. 'Goolwa barrage appointments were announced. Mr Samuel P Limb, who has been associated with River Murray lock work for nearly twenty years, under the SA Engineering and Water Supply Department, has been appointed superintendent of the River Murray Barrages. Mr Limb has occupied the position of foreman mechanic for much of the lock and barrage construction. He was associated with Locks 5,6,7 and 8.'

Mr Francis G Fidge, who has been appointed assistant superintendent of the barrages, was a foreman in the River Torrens floodwaters scheme and in the Murray Barrage work. Formerly he was engaged in work on the lower irrigation areas on the River Murray, particularly in bank construction and flood protection, including the special steps taken in the great 1933 floods'.

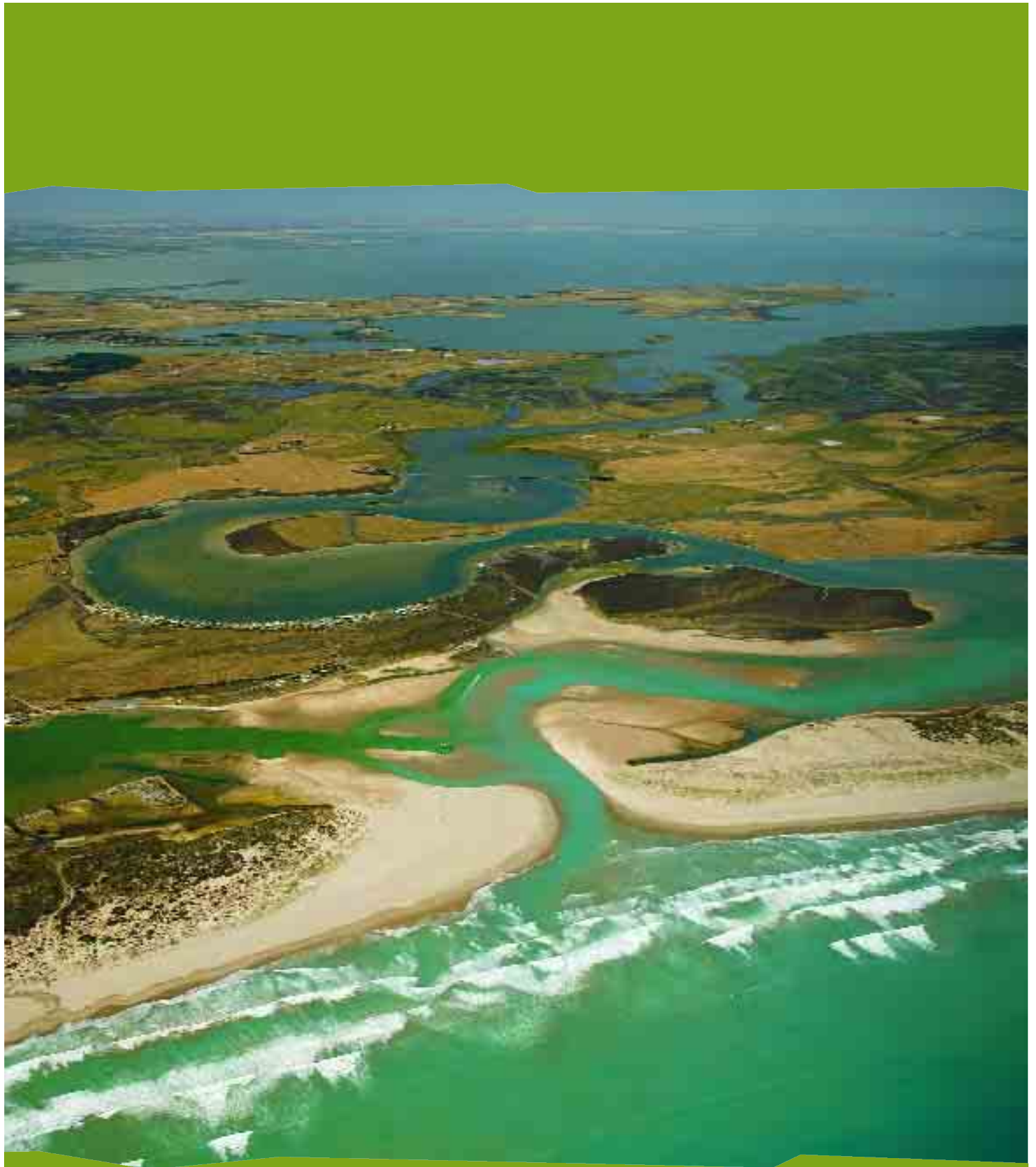
17 July. Southern Argus. Goolwa News. 'Work at the Barrage is practically completed, the two houses for the superintendent and assistant are rapidly taking shape, and it is now a real pleasure to see the effect of the barrages on the freshwater'.


4 September. Southern Argus. News from Goolwa. 'The Barrages. For some reason best known to the authorities the Goolwa barrage has been closed. This has had the effect of raising the level of the River, which is very high at Goolwa just now. Should there be a series of strong westerly blows it is quite possible that several low lying parts adjacent to Lake Alexandrina must be flooded. The Mundoo barrage has been opened to relieve the pressure to a degree. Residents are wondering why so much water is being held back, and it appears to becoming stagnant'.

1940

1940

1940





Saving the Murray-Darling Basin What Must be Done

July 2008



liberal sa

Contents

1.1	Foreword	3
2.1	Background	4
3.1	Opportunity Lost	5
4.1	Failure: The MOU and the July 2008 COAG Agreement	6
5.1	What must be done: A Fresh COAG Agreement	9
6.1	Making a Start: A Plan for Action	11
7.1	Bibliography	12

1.1 Foreword

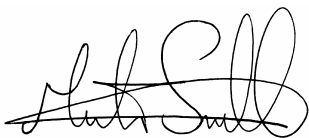
The Murray Darling Basin is in crisis from its most northern extremities to the Murray Mouth. Only national control and management of the river can save it.

A rescue will require strong leadership from Prime Minister Rudd and Labor Governments both Federal and State. The vested interests of the States must be overruled. The States must relinquish and refer their constitutional powers in respect of the river to the Commonwealth, or the Prime Minister must over rule the states and seize control using whatever powers are available. Prime Minister Hawke did this to protect the Franklin River in Tasmania.

The States will squabble over the river irrespective of which political party governs in respective States. The States have ruined the river and they will continue to do so. That is why a national approach comprised of a referral of powers from the states to the Commonwealth, the establishment of a strong independent authority to take control of the river and a genuinely national plan to preserve it are vital.

Our National government must provide for critical human needs, the river environment and the sustainability of the system and for the needs of irrigators and river users. 93% of the river's water is used upstream of the SA border. We can only lose from the status quo. There must be change.

It's time for action – South Australia deserves better.



**Martin Hamilton-Smith, MP
Leader of the Opposition**



**Mitch Williams, MP
Shadow Minister for Water**



2.1 Background

The Constitution enacted in 1901, section 100 provides that “The Commonwealth shall not, by any law or regulation of trade or commerce, abridge the right of a State or of the residents therein to the reasonable use of the waters of rivers for conservation or irrigation.” The cause and effect of this section means that the States maintain certain rights in relation to the Murray-Darling.

Over the years the states under various governments of all political persuasions have over allocated water within the system and neglected both the environment, each other and the national interest. Previous droughts in the early 1900’s and during World War II have brought the river to the verge of collapse but never to the extent now apparent. The relatively uncontrolled allocation of water in recent decades, combined with drought and climate change have changed the dynamics unsustainably.

This drought started in 2002. Based on the twelve year drought which lasted from 1938 until 1950 this one could continue for another six years.¹ The impact of forecast climate change and reduced rainfall patterns will further exacerbate the impact of this drought.

When it does rain the States will be fighting over who gets the rainfall as storages fill, unless a nationally driven plan is in place. Clearly the governance arrangements of the past have failed. The Murray Darling Basin has been abused and misused by the States. Present arrangements cannot cope with changing climate patterns and the expanded irrigation land use of recent decades.

This is a crisis of the Federation. Labor’s “Co-operative Federalism” will not solve it. A new set of governance arrangements and a new plan are needed. Once set there can be no going back.

¹A Future-Proofed Basin – A new water management regime for the Murray-Darling Basin, Young & McColl, University of Adelaide 2008 p 20.

3.1 Opportunity Lost

In January 2007 the Howard Liberal Government announced *A National Plan for Water Security* to save the Murray-Darling. In March 2008 the Water Act 2007 was enacted. The Act provided for the referral of state powers to the Commonwealth and the establishment of the Murray-Darling Basin Authority.

On the condition that the States gave up their powers so that the Commonwealth could act decisively, the Howard Plan provided a \$10 billion package designed to ensure that rural water use was placed on a sustainable footing over the next decade. A cornerstone of the commitment was \$6 billion over 10 years to modernise irrigation infrastructure. \$3 billion was directed over 10 years to address over allocation in the basin including the buyback water licences.²

Although an agreement was never signed by the State Premiers, all State Labor governments excluding Victoria and all State Oppositions signalled their agreement.

The SA Liberal Opposition criticised Premier Rann at this time for not doing enough to secure the Victorian Labor Government's agreement to the measure. Labor State Governments and the Rudd Labor Opposition were publicly criticised for slowing up action prior to the November 2007 Federal Election. Labor played politics with the issue and continues to do so.

² A National Plan for Water Security, 25 January 2007, p 4.

4.1 The MOU and the July COAG Agreement

The Federal Government changed in November 2007. Since that time there have been four Council of Australian Government (COAG) meetings (20 December 2007, 13 April 2007, 26 March 2008 and 3 July 2008). Water was only put on the agenda on the eve of the March 2008 meeting after intense public pressure and pressure from the State Liberals. In March 2008 COAG signed a Memorandum of Understanding (MOU) on the Murray-Darling Basin which made significant changes to the Howard Government approach.

In July 2008 the MOU became a COAG Intergovernmental Agreement on the Murray Darling Basin Reform.

Labor's July 2008 COAG agreement weakens the Howard Government proposal in several significant ways including:

- The States will no longer be required to refer their powers to the Commonwealth;
- The Murray Darling Basin Authority has been weakened as a result of powers retained by the states through a Ministerial Council;
- The implementation of a national plan to manage the Murray was deferred until 2011 after respective state and federal elections. State water plans remain in place in Victoria's case until 2019.³
- State water shares will remain in place and can only be changed subject to the unanimous approval of Basin States.

Labor's COAG agreement is not an enforceable contract. It has neither penalties or remedies against recalcitrant parties. The States have not referred their powers and therefore retain a veto over decisions made by the Murray Darling Basin Authority. The so-called agreement is awash with general statements like "the Basin States agree to use their best endeavours".⁴

³ Memorandum of Understanding, March 2008 p 6.

⁴ Agreement on Murray Darling Basin Reform, 3 July 2008, p 6.

In effect the COAG agreement was an agreement to disagree. Each state will “row its own boat” and manage its share of the water at least until 2011 as it sees fit until the proposed Basin Plan comes into effect. No immediate new flows of water are provided for through the buyback of over allocated water licences.

Over \$5 billion was provided for infrastructure. The funding included \$1 billion for Victoria’s Food Bowl project with an additional \$106 million to assist private irrigators in the modernisation of their irrigation infrastructure. New South Wales received \$1.358 billion for a suite of initiatives to modernise and upgrade irrigation infrastructure plus \$650 million to private irrigators. Queensland was provided with \$510 million for irrigation planning and infrastructure investment and for buying water from willing sellers. There was \$85 million for a salt interception scheme for the Australian Capital Territory. South Australia received \$610 million to upgrade irrigation infrastructure and improve river management, this includes \$110 million for private irrigators to upgrade infrastructure, \$80 million for water purchasing from willing sellers and \$200 million for the Coorong and the Lower Lakes.

Not a drop of extra water has been secured for SA under this agreement, which has preferred infrastructure investment to the much tougher task of dealing with unsustainable over allocation of water licences along the basin.

The worst fears of people in the Lower Lakes will be realised because the infrastructure spending will alleviate the need for towns and food producers to draw fresh water from the Lower Lakes. This will enable Labor Governments to inundate the Lower Lakes with salt water by opening the barrages combined with the construction of a weir at Wellington. Mike Rann has given up on the Lower Lakes and the dye is now cast for salt water to flow into the lakes.

Clause 2.4.6 page 7 of the IGA states that there is to be a separate intergovernmental agreement yet to be agreed upon which this current document will depend, thus qualifying the agreement with further deliberation.

Clause 3.2.7 page 9. Indicates that State water shares (plans) prevail. Any disagreements "will be referred to the Ministerial Council for strategic direction" i.e. State Ministers to squabble around the table.

Clause 3.2.8 page 9. Confirms that "State water shares can only be changed by the unanimous decision of the Ministerial Council". i.e. States retain veto powers.

Clause 3.2.10 page 10. States that "The Parties agree that SA will have access to storage capacity in the Hume and Dartmouth dams for the purpose of private carryover, subject to this not affecting upstream states water availability and storage access". In other words Victoria and NSW go first.

5.1 What must be done

General

State Governments regardless of which political party is in Office in any respective State will not and cannot solve this problem. State Governments will look after their own States. That's what they have been elected to do. This is the blunt truth of water politics.

A Fresh COAG Agreement

If South Australia's stake in the River Murray is to be saved Prime Minister Rudd and Federal Labor must ensure all States go back to the drawing board and start again with a fresh COAG agreement which refers powers to the Commonwealth, which provides for the Murray-Darling Basin Authority to have all the powers needed to take control of the Basin and which delivers a new plan by the end of 2009 for the long term health of the river. Labor has got it wrong with this COAG agreement. It must be torn up. We must start again. This time we must get it right. Labor's Premier in SA, Mike Rann must make this his obsession!

Constitutional Powers

Professor John Williams of the University of Adelaide and other experts in Constitutional Law have stated that there is no constitutional impediment to the Commonwealth taking control of the Murray-Darling Basin System.

Accordingly, the Federal government should exercise those powers and enact legislation to confer all necessary authority in the Federal Minister. If, contrary to the constitutional law advice, the Commonwealth does not have the powers, the State Liberal policy is that the States' powers be referred to the Commonwealth.

Stronger Governance

The State Liberals policy is that the fresh COAG agreement must provide for a truly independent Murray Darling Basin Authority reporting to the Commonwealth Government with the power to over rule the states to manage the river in the best interests of the nation. Only COAG should be able to vary the powers of the Authority and there should be no need for a Ministerial Council outside of COAG.

No NSW, Victorian or QLD politician will ever put the interests of the environment in SA or our food producers ahead of their own constituents. South Australia needs a national plan in place sooner than 2011. The Prime Minister and the Federal Government must then act fairly, act responsibly and act in the best interests of the environment and all citizens who depend upon the river.

The multi tiered arrangement with powers devolved between the Federal Minister, the Murray-Darling Basin Authority, the new Ministerial Council, the Basin Officials Committee and the Basin Community Committee reinforces the current confused arrangements where accountability is easily avoided and vested interests are protected.

Critical Human Needs

The State Liberal's view is that Labor must ease Adelaide's reliance upon the River Murray by fast tracking Adelaide's desalination plant at Port Stanvac, by enhancing wastewater reuse capabilities and by building stormwater catchment and reuse infrastructure. The Rann Labor Government has moved far too slowly on the Liberal's desalination plan. Mr Rann plans to open the plant in late 2011. This is not good enough, it should be producing water sooner. Greater urgency is needed. The Rann Government must also implement the State Liberal's \$400 million stormwater infrastructure plan at 13 sites in the Adelaide precinct⁵ The Glenelg to Adelaide pipeline must be increased in diameter to move both wastewater and stormwater to the city. Finally Labor must do more for wastewater recycling. The key pieces of infrastructure for wastewater reuse were built by the Brown/ Olsen State Liberal Governments from Christies Beach to Bolivar.⁶ Plan to enhance these capabilities must be fast tracked. The Rudd Government must use its infrastructure funds to assist where it can. Only in this way can Adelaide's critical human needs be met without an absolute unyielding reliance upon the River Murray.

⁵ www.martin2010.com.au

⁶ Advertiser Article, Taking the plunge 23 November 1998 and Public Works Committee, Christies Brach Wastewater Treatment Plant, Environment Improvement Project, January 2001, page 9

6.1 Making a Start: A Plan of Action

Only within the framework of a fresh COAG agreement can a new national plan for the river be forged. The State Liberals believe that a national basin plan must be developed ideally within 12 months, certainly by the end of 2009. It simply cannot wait until 2011. This plan must address a range of issues including: reacquisition of over allocated water entitlements, environmental flows, the establishment of a stable water market and workable trading arrangements, annual caps on water to be traded out of any one region, access to storages and host of other concerns.

COAG must guide the development of the plan but the State Liberals note the views of Professor Mike Young and the Wentworth Group of Scientists, with particular regard to the need to compulsorily buyback all water licences in order to reset the system.⁷

The South Australian State Liberals view is that over allocation is the most pressing issue to be addressed. Only by reducing the demands on the river can environmental flows be improved. The current 'Buy Back' of licences from willing sellers is delivering too little, too slowly.

A recent report by Waterfind⁸, suggests that if all water available for sale was purchased under the current scheme, it would take at least 14 years to purchase 1500 gigalitres. The problem requires greater urgency.

Consequently the State Liberals propose that a strategic reduction in all irrigation allocations across the basin be made immediately to secure 750 gigalitres of water (this equates to 6.1% of all licensed allocation). We must make a start. This proposed reduction would be compensated at the current market value for each specific class of licence.

We must start again. A new plan for a new era.

⁷ A Future-Proofed Basin – A new water management regime for the Murray-Darling Basin, Young & McColl, University of Adelaide 2008

⁸ Analysis of the Effect of the Federal Government's Buy Back of Permanent Water Entitlements, Water Find Pty Ltd, p 1.

7.1 Bibliography

A Future-Proofed Basin – A new water management regime for the Murray-Darling Basin, Young & McColl, University of Adelaide 2008

A National Plan for Water Security, 25 January 2007

Agreement on Murray Darling Basin Reform, July 2008

Analysis of the Effect of the Federal Government's Buy Back of Permanent Water Entitlements, Water Find Pty Ltd, 2008

Waterproofing South Australia, State Liberal Policy August 2007

Public Works Committee Report, Christies Brach Wastewater Treatment Plant, Environment Improvement Project, January 2001

Memorandum of Understanding, March 2008